

THE YOM KIPPUR WAR
AND THE SHAPING OF THE UNITED STATES AIR FORCE

BY
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APPROVAL

The undersigned certify that this thesis meets master's-level standards of research, argumentation, and expression.

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DISCLAIMER

The conclusions and opinions expressed in this document are those of the author. They do not reflect the official position of the US Government, Department of Defense, the United States Air Force, or Air University; the British Government, the Ministry of Defence, or the Royal Air Force.



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ABSTRACT

This study assesses the influence of the Yom Kippur War of October 1973 on the development of the United States Air Force. The author demonstrates how vicarious lessons based on Israeli combat experience interacted with American lessons from Vietnam. The Air Force participated in varied post-conflict analyses and identified lessons with relevance for equipment, training, tactics and doctrine. Many subsequent developments can be traced back *through* the war, which catalyzed existing or nascent trends. In some cases, however, the origins of capabilities and concepts can be traced back *to* the conflict. Key individuals contributed to - and were in turn influenced by - these organizational processes. The study concludes that the Yom Kippur War reinforced a conventional paradigm of 'war as battle' and also encouraged a long-term trend of American-Israeli parallelism. These developmental vectors help to explain the capabilities and outlook of the Air Force today.



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Figure 1: Israel and the Occupied Territories, October 1973.

Reprinted from Simon Dunstan, The Yom Kippur War (Oxford: Osprey, 2007), 9.

Introduction

The fact of a war stimulates evaluation and reaction. It is a vivid and instructive experience. This should be particularly so for the Middle East War, considering that numerous, modern forces were pitted against each other.

Dr Malcolm Currie, Director Defense Research and
Engineering, to House Armed Services Committee,
26 February 1974.

The Yom Kippur War of October 1973 had a fundamental influence on the United States Air Force.¹ High-intensity conventional combat between Israeli and Arab forces was interpreted as a microcosm of a future US war against the Soviet Union in Europe and this established a developmental vector that still resonates today. In many ways, the war represented the birth of modern conflict as understood by the US military through the 1991 Gulf War and beyond. This mainly vicarious experience was in some ways more influential than - and certainly interacted *with* - the direct experience of Vietnam, although the latter dominates historical accounts of US military development. Explanations of US Air Force history since 1973 that focus upon Vietnam and mention the Yom Kippur War only briefly - if at all - are 'normal', but they are also incomplete. This study does not seek to refute these 'normal' accounts so much as expand them.

The Yom Kippur War exerted short and long term influence upon the development of Air Force equipment, training, tactics and doctrine. Together these contributed significantly to the nature of the present day Air Force - its great many unparalleled strengths, but also areas of

¹ The 1973 Arab-Israeli war is also known as the October War, especially in Arab histories. It is most frequently referred to in the West as the Yom Kippur War after the Jewish holy day deliberately chosen for the Arab assault (Rabinovich, *The Yom Kippur War*, 46). The Yom Kippur War is the preferred label throughout this study.

conceptual and operational challenge. The overall effect of the Yom Kippur War was to reinforce an emphasis upon high-intensity regular conflict, or 'war as battle.' The conflict validated an organizational focus on conventional aspects of Vietnam and confirmed the rejection of irregular warfare as a potential guide for future capability development. The air instrument that was subsequently created has enjoyed peerless success in conventional warfare, most clearly during mechanized force-on-force conflict in the Persian Gulf in 1991; but it has been only ambiguously effective in extra-paradigm conflicts, such as in the Balkans in the 1990s, and during irregular campaigns against insurgent opponents since 2003. Again, existing accounts of this trend tend to miss or simplify the role of the Yom Kippur War in shaping the US Air Force. This study attempts to fill in the blanks, and tell that story.

The Yom Kippur War was not an entirely vicarious learning experience for the US military. Direct material and technical support was delivered to Israel during Operation Nickel Grass. Moreover, the Israelis were equipped with a great deal of modern American equipment and this underwent a significant 'trial by fire' against countering Soviet systems. From the US point of view, the Yom Kippur War may have been an Israeli war but it was fought with American 'kit.' The war therefore represented a synthesis of the idea that one learns most from one's own experiences, but *best* from those of others. The strength and relevance of the war's lessons may be explained by these combined experiential modes. Moreover, the importance of *individuals* within *organizational* processes is a recurring theme throughout this study. Individual planners and leaders influenced - and were in turn influenced *by* - Air Force reforms after 1973.

In structure, this study moves from the specific to the thematic; from the immediate contemporary influence of the Yom Kippur War towards an evaluation of its broader and enduring relevance. The first chapter provides an overview of the conflict and describes the war in the

air. It then summarizes the war's major lessons as interpreted outside the US military in academic and international analysis. For these observers, the war demonstrated the lethality and high attrition rates of modern battle; the specific challenge posed by modern Soviet air defense systems; the subsequent need for defense suppression capabilities and enhanced aircraft survivability; the importance of airlift; and a general need for technical and conceptual advantages with which to 'offset' Soviet superiority in Europe.

Chapter Two explores the specific processes by which the US military establishment, and the Air Force in particular, sought insights from the war. The Air Force participated in a number of joint fact-finding missions and also directed its own complementary studies. American leaders met with Israeli officers and established relationships that influenced later reforms. These learning processes involved field grade officers who would later hold senior commands, including then-Lieutenant Colonel C.A., or 'Chuck', Horner. Air Force conclusions paralleled external analysis, placing a clear emphasis on the challenges posed by modern air defense systems. These findings influenced policymakers who then drove change in a variety of capability areas.

Chapter Three explores the impact of the Yom Kippur War on Air Force equipment, training and tactics - the *means*, and elements of the *ways*, of modern air warfare. The conflict catalyzed a broad range of equipment programs and initiated others. For example, defense suppression capabilities can be traced back *through* the Yom Kippur War, having clear origins in earlier conflict, notably Vietnam. Here, the war reinforced existing trends, adding clarity and urgency rather than sudden novelty. In other areas, notably stealth technology and the F-117 in particular, developments can be more specifically traced back *to* lessons drawn from October 1973. These technological offsets were matched by conceptual offsets in training and tactics. The war built upon reform initiatives that had their origins in Vietnam. Air Force

officers including General Robert Dixon and Major Richard ‘Moody’ Suter blended the lessons of Vietnam and the Yom Kippur War; they reconfigured training programs and incorporated modern threats into complex exercises such as Red Flag. This in turn allowed the maturation of tactics that exploited novel technologies in a mutually reinforcing developmental process. The 1991 Gulf War demonstrated the success of this ‘offset’ strategy and Air Force capability reforms.

At the operational level, Chapter Four analyzes the effect of the war on doctrine and campaign execution. Here, the Air Force learned not only vicariously, but by proxy, as the US Army drove doctrinal change. The Yom Kippur War had a profound influence on Army General Don A. Starry, whose AirLand Battle doctrine influenced air equipment programs through the 1980s and also eroded strategic/tactical distinctions within the Air Force. The war therefore influenced *air* power at the operational level through its impact on *land* power – a second-order form of influence, with the war first ‘filtered’ through an external actor before driving changes in the Air Force itself. The war did, however, influence later doctrinal reforms that originated within the Air Force, and here individuals were once again at the center of organizational change. John Warden’s ideas were informed by his studies of the Yom Kippur War while a field grade officer in the Pentagon, and his later concepts were enabled by the capability developments that could be traced back through, or to, the Middle East conflict. Finally, the attitudes and understanding of leaders who planned and executed Operation Desert Storm - including Brigadier General Larry Henry and the now-senior Lieutenant General Chuck Horner - illustrate the Yom Kippur War’s long-term influence on the Air Force’s ‘Vietnam Generation.’

The concluding chapter examines the Yom Kippur War’s long-term relevance at an overarching conceptual level. The conflict reinforced a paradigmatic American way of war, characterized by a focus on high-end, regular warfare - a view of ‘war as battle.’ This gave broad, uniform

direction to the developmental processes outlined in the body of this study. The nature and timing of the Arab-Israeli conflict confirmed this existing paradigm and hastened the rejection of uncomfortable, but potentially *useful*, irregular warfare lessons from Vietnam. The Air Force that fought so successfully in the Persian Gulf in 1991 was a product of this reinforced paradigm, but so too was the Air Force that struggled to apply high-end forces in irregular campaigns in Kosovo in 1999, and in Iraq and Afghanistan after 2003. This tension between ‘old war’ means and ‘new war’ problems also highlights a longer term parallelism between American and Israeli experience that dates back to the Yom Kippur War. The Israeli Air Force enjoyed access to American technology, while the US Air Force derived continuing vicarious benefit from Israeli combat experience. Both air forces, however, struggled to reconcile a prevailing regular war focus with irregular challenges. This parallelism again undermines a typical narrative that tends to focus solely on how the US Air Force ‘fixed itself’ after Vietnam. The development of the modern Air Force – capable without peer in a great many areas, but imperfect – ‘warts and all’ – cannot be understood by considering direct American experiences in isolation. The Yom Kippur War – a brief but spectacular conflict that occurred at a critical moment in time - contributed to developmental vectors with enduring resonance today.

Chapter 1

The Yom Kippur War in Overview

The Yom Kippur War was the fourth in a sequence of major Arab-Israeli conflicts that followed the formation of the state of Israel. Two of the three preceding conflicts - the War of Independence in 1948 and the Six-Day War of 1967 - had resulted in clear Israeli victories. The Six-Day War in particular had been a remarkably one-sided contest. The Israeli Air Force had launched a preemptive attack that destroyed its Egyptian counterpart in a single morning. Israeli combined arms forces subsequently raced to victory on multiple fronts, taking possession of significant areas of Egyptian and Syrian territory - the Sinai Desert to Israel's south and west and the Golan Heights in the northeast. Israeli forces also seized the Jordanian West Bank and - most symbolically for the Jewish state - took sole possession of the city of Jerusalem. In that war, Israel established territorial defense in depth and won an astonishing military success.¹

The 1967 conflict was followed by sporadic fighting along the Suez Canal that culminated in the Israeli construction of the Bar-Lev defensive line during late 1968 and early 1969.² The creation of the Bar-Lev line provoked Egypt into launching sustained attacks on Israeli positions. The resulting conflict, known as the War of Attrition, lasted from March 1969 until August 1970.³ This period of hostilities was characterized by artillery exchanges, commando raids and aerial battles. To defend against the Israeli Air Force, the Egyptians employed increasing numbers

¹ Simon Dunstan, *The Yom Kippur War: The Arab-Israeli War of 1973* (Oxford: Osprey, 2007), 7.

² Chaim Herzog, *The War of Atonement: The Inside Story of the Yom Kippur War* (London: Greenhill Books, 2003), 5-7.

³ Abraham Rabinovich, *The Yom Kippur War: The Epic Encounter That Transformed the Middle East* (New York: Schocken Books, 2004), 7.

of Soviet-supplied missile systems in the canal zone. This afforded the Israeli Air Force some experience against modern air defense systems, notably the SA-2 and SA-3, but it also resulted in a steady loss of Israeli aircraft despite the provision of American electronic countermeasure (ECM) equipment.⁴ Despite relatively heavy casualties and a growing sense of unease among Israeli Air Force leaders concerning the threat posed by the Egyptian SAM threat, the Israeli military emerged from the War of Attrition with its reputation as the supreme victor of 1967 largely intact.

Unlike the conflicts in 1948 and 1967, however, the war unleashed by Egypt and Syria on 6 October 1973 would not end with an unambiguous Israeli victory. A combination of hubris and poor intelligence meant that Israel was surprised by the timing and extent of the attack. Prior to the war, Israeli Prime Minister Golda Meir had viewed Arab threats as inflated. In a private lunch with the UN Secretary-General in September 1973 she had stated:

...you are always saying that the situation in the Middle East is dangerous and explosive, but we don't believe you. The Arabs will get used to our existence and in a few years they will recognize us and we shall have peace. So don't worry. It is a disagreeable situation, but we do not believe there is any real danger for us.⁵

Israel's subsequent intelligence failures were near total, and the war was later described as having represented "something of an Israeli Pearl Harbor."⁶ Moreover, although the Israelis received last-minute

⁴ Herzog, *War of Atonement*, 8, 252-4; Shmuel Gordon, "The Air Force and the Yom Kippur War: New Lessons," in *Revisiting the Yom Kippur War*, ed. P. R. Kumaraswamy (London: Frank Cass, 2000), 222; Dunstan, *The Yom Kippur War*, 12-13.

⁵ David R. Morse, *Kissinger and the Yom Kippur War* (Jefferson, NC: McFarland, 2015), 53-54.

⁶ Herzog, *War of Atonement*, xiii.

warnings of an Arab attack, political imperatives made a preemptive air attack of the type that had proven so beneficial in 1967 impossible in 1973. US support was understood as being contingent upon Israel's non-aggression in any new Middle Eastern war.⁷ The ill-prepared Israelis therefore ceded the initiative to their adversaries.

Massed formations of Egyptian armor and infantry, backed by artillery and air strikes, assaulted across the Suez Canal in the afternoon of 6 October. Simultaneously, Syrian forces - later supported by Iraqi and limited Jordanian detachments - attacked Israeli positions on the Golan Heights. The Israeli Air Force scrambled aircraft to support embattled ground forces; however, Egypt and Syria had received huge shipments of Soviet air defense equipment since the end of the War of Attrition and dense SAM 'umbrellas' shielded Arab forces from Israeli Air Force attacks on both fronts.⁸ Desperate mobilization during the first few days barely prevented an Israeli collapse and, by 8 October, Arab forces had made consolidated gains in both the Golan and the Sinai.

Israeli determination and skill, Arab mistakes, and US material support slowly turned the tide of the conflict. On 13 October, US President Richard Nixon ordered the resupply of Israel.⁹ The resulting operation, Nickel Grass, included the airlift of large quantities of US equipment and weapons and the delivery of combat aircraft from front line American units to Israeli squadrons. Thus supported, the Israeli military countered effectively and took advantage of Arab operational mistakes to advance beyond their original positions on both fronts. Israeli forces were thus militarily ascendant when a ceasefire was declared on 24 October.

⁷ Emanuel Sakal, *Soldier in the Sinai: A General's Account of the Yom Kippur War* (Lexington, KY: University Press of Kentucky, 2014), 425-426.

⁸ Dunstan, *The Yom Kippur War*, 8, 21; Herzog, *War of Atonement*, 31, 254; Rabinovich, *The Yom Kippur War*, 26, 47.

⁹ Morse, *Kissinger and the Yom Kippur War*, 95.

Israel had turned potential defeat into battlefield success; however, the Jewish state's financial and human losses had been enormous. The Israeli Assistant Minister of Finance estimated that the war cost \$5 to \$6 billion, with defense expenditure in 1973 totaling 40 percent of Israel's gross national product.¹⁰ Combat had been waged with an intensity not witnessed since the Second World War.¹¹ Israel, with more than 2,500 killed and 7,250 wounded, had lost "almost three times as many men per capita in nineteen days as did the United States in Vietnam in close to a decade."¹² The war in the air had been especially difficult. Israel viewed air power as the primary component of national defense and, by 1973, the Air Force attracted half of all Israeli defense spending.¹³ Despite this level of investment, however, Israeli air power had been unable to repeat the successes of 1967. A number of factors, both Arab and Israeli, explained this outcome.

Missiles and Bent Wings: The Air War

The Israeli Air Force found itself trapped by operational circumstances in October 1973 and unable to prosecute the type of campaign that it had prepared for. Extant Israeli doctrine prioritized air power missions.¹⁴ The primary role was defense of Israeli territory. The destruction of an enemy's air force was then the dominant offensive mission. Experience of Soviet-supplied air defenses during the War of Attrition meant that a third priority, the destruction of the enemy's 'anti-

¹⁰ House Armed Services Committee, to Secretary of the Air Force, memorandum, 29 November 1973, 8. Document is now declassified.

¹¹ Martin Van Creveld, *Military Lessons of the Yom Kippur War: Historical Perspectives* (Beverly Hills: Sage, 1975), ix, 14-15, 47-48; Benjamin S. Lambeth, *The Transformation of American Air Power* (Ithaca, NY: Cornell University Press, 2000), 56.

¹² Rabinovich, *The Yom Kippur War*, 497- 498.

¹³ Sakal, *Soldier in the Sinai*, 69; Dunstan, *The Yom Kippur War*, 128.

¹⁴ Herzog, *War of Atonement*, 255.

aircraft system', had become a prerequisite for the final role, the provision of "flying artillery" in interdiction strikes and close support of ground forces.¹⁵ However, the surprise Egyptian and Syrian attacks forced the Israeli Air Force straight into this interdiction role before enemy defenses could be targeted. This exposed Israeli aircrews to the full capabilities of Soviet SAM and gun systems possessed by the Arab nations.¹⁶ In a military briefing held in Israel on 22 October for US Secretary of State Henry Kissinger, with Israeli Prime Minister Golda Meir in attendance, Israeli Air Force Chief of Staff Major General Binyamin Peled explained:

We have found, under the situation... that we have had to do everything an Air Force has to do in reverse order - which was much harder. Usually we first do the air defense. But we had to do ground support immediately and only then [take on the air defenses].¹⁷

The first days of the air campaign were therefore traumatic for the Israeli Air Force. In the southern sector, the Israelis lost as many as 14 strike aircraft in the first three hours of the war alone.¹⁸ The Israelis launched a preplanned operation against Egyptian air defenses on 7 October, Operation *Tagar*, but this was compromised by the coincident need to attack Egyptian ground formations.¹⁹ Moreover, only the first phase of *Tagar*, focused on the suppression of Egyptian airfields and

¹⁵ Stuart A. Cohen, "Operational Limitations of Reserve Forces: The Lessons of the 1973 War," in *Revisiting the Yom Kippur War*, ed. P. R. Kumaraswamy (London: Frank Cass, 2000), 86, 88-89.

¹⁶ Herzog, *War of Atonement*, 256.

¹⁷ Henry A., Kissinger, Secretary of State, memorandum of conversation, 22 October 1973. Document is now declassified.

¹⁸ Joint Chiefs of Staff, United States Military Equipment Validation Team (USMEVTI), *Trip Report to Israeli Defense Forces 28 October – 8 November 1973*, 1973, 2. Document is now declassified.

¹⁹ Shmuel Gordon, "Air Superiority in the Israel-Arab Wars," in *A History of Air Warfare*, ed. John Andreas Olsen (Washington, D.C.: Potomac Books, 2010), 144-145.

some AAA sites, could be completed before the air force was diverted to support operations in the north.²⁰ Egyptian SAM sites were therefore left untouched. The operation was viewed as a failure.²¹ In fact, for many senior Israeli Air Force officers, the incomplete execution of *Tagar* was the most critical mistake of the war, denying Israel an early victory in the Sinai.²²

Early failure was equally stark in the northern sector. One hundred and twenty-nine sorties were flown against ground targets in the first 30 hours of fighting but Israeli ground forces were pushed back and Israeli aircraft losses were high.²³ The potency of Syrian SAM defenses in these early hours of the war was evident in the fate of a close air support mission attempted at dawn on 7 October. An entire four-ship of A-4 Skyhawks, called in by infantry commander Lieutenant Colonel Oded Erez, was shot down by Syrian missiles. A second flight of Skyhawks lost two of its number to further missiles as appalled Israeli ground troops watched. Given such losses, Erez quietly “declined to call for any more air support.”²⁴

The Israeli Air Force attempted to prosecute a preplanned operation against the northern Syrian defenses later on 7 October, Operation *Dugman*. As in the south, however, the operation was a failure. The Israelis lacked updated positions for mobile SA-6 systems, and electronic warfare helicopters had been transferred to the Egyptian sector and could not be repositioned in time. Desperate calls for close air support by ground forces engaged on the Golan Heights further compromised Israeli Air Force efforts to focus on the counter-SAM mission. As a result, the *Dugman* attacks against Syrian missile sites resulted in the destruction of only a single SAM battery - and the loss of

²⁰ Rabinovich, *The Yom Kippur War*, 176-178.

²¹ Gordon, “Air Superiority in the Israel-Arab Wars,” 144-145.

²² Rabinovich, *The Yom Kippur War*, 179.

²³ Gordon, “Air Superiority in the Israel-Arab Wars,” 148.

²⁴ Dunstan, *The Yom Kippur War*, 160.

six F-4 Phantoms, with another ten heavily damaged.²⁵ The failure of Operation *Dugman* has been called the “most important defeat in the history of the IAF.”²⁶ Israeli Air Force confidence was shaken, and the air force remained committed to close air support missions without having achieved control of the air.²⁷ By the end of 7 October, the Israeli Air Force had lost 14 aircraft during 272 strike sorties in the Golan, a localized attrition rate of over five percent.²⁸

These attrition rates were startling, and so too were the ground losses suffered while the air force struggled to overcome Arab air defenses. On the morning of October 9, Israeli Ambassador Simcha Dinitz relayed early losses to US Secretary of State Henry Kissinger:

Secretary Kissinger: I need an accurate account of what the military situation is.

Ambassador Dinitz: We got a message that sums up our losses until 9 a.m. Israeli time. In planes, 14 Phantoms, 28 Skyhawks, 3 Mirages, 4 Super Mysteres - a total of 49 planes. Tanks - we lost something like 500 tanks...

Secretary Kissinger: 500 tanks! How many do you have?²⁹

The shock of these Israeli losses was evident, and the importance of replacing air assets as a priority was also clear. Ambassador Dinitz's first pleas for US aid were for replacement aircraft.³⁰

In the south, the Israeli Air Force achieved freedom from ground threats only when Egyptian forces attacked beyond the coverage of their SAM ‘umbrella’ on 14 October. The results were decisive - the Egyptians

²⁵ Operation *Dugman* described in Gordon, “Air Superiority in the Israel-Arab Wars,” 146, 148. Also Rabinovich, *The Yom Kippur War*, 178-179.

²⁶ Gordon, “Air Force and Yom Kippur War,” 225.

²⁷ Gordon, “Air Force and Yom Kippur War,” 224.

²⁸ USMEVTI, *Trip Report*, 4.

²⁹ Henry A. Kissinger, Secretary of State, memorandum of conversation, 9 October 1973. Document is now declassified.

³⁰ Morse, *Kissinger and the Yom Kippur War*, 79.

lost 260 tanks to Israeli ground and air attack in the largest tank battle since the Battle of Kursk in 1943.³¹ This Egyptian reverse was followed by an Israeli armored raid across the Suez Canal on 16 October during which Israeli forces destroyed a number of SAM positions. Israeli General Avraham Adan, commander of the armored division that crossed the canal, summarized the effect this raid had on the contest between Egyptian air defenses and the Israeli Air Force as follows:

It was clear that the Tsach position [a fortified Egyptian site on the western side of the Suez Canal] was preventing our breakthrough into open terrain. I asked for air support but was told that the antiaircraft missile batteries in the area made this impossible. I suggested that we raid the surface-to-air missile batteries in order to open the skies for the air force, and this idea was approved... [our] tank force assaulted the site and destroyed it... Those raids had a major impact on the battlefield... As a result of the raids, the Egyptians decided to move back some other forward missile batteries, thus enabling the air force to attack Tsach the following day and assist our advance.³²

The Israeli tankers' actions in support of the air force derived mutual benefit. The partial collapse of the Egyptian SAM 'umbrella' allowed the Israeli Air Force to provide effective close air support to Israeli troops in the canal zone. Attrition rates fell. The Air Force lost only four aircraft during 2,261 strike sorties in the Sinai zone between the canal crossing on 16 October and the end of the war on 24 October.³³

Syrian air defenses were never truly degraded in the northern zone.³⁴ Echoing the experience in the south, the Israeli Air Force enjoyed

³¹ Dunstan, *The Yom Kippur War*, 22.

³² Avraham Adan, *On the Banks of the Suez: An Israeli General's Personal Account of the Yom Kippur War* (San Rafael, CA: Presidio Press, 1980), 319-320.

³³ USMEVTI *Trip Report*, 5.

³⁴ USMEVTI *Trip Report*, 6; Anthony H. Cordesman and Abraham R. Wagner, *The Lessons of Modern War Volume 1: The Arab-Israeli Conflicts, 1973-1989* (Boulder, CO: Westview Press, 1990), 83.

freedom of action only when the ground battle moved beyond the range of Syrian SAMs. The Israelis were here assisted by the deployment of the Syrian air defenses well to the east, and the reluctance of Syrian commanders to redeploy SA-6 systems to support early gains.³⁵ Arab formations that maneuvered beyond the extent of their air defense coverage were decimated by Israeli ground and air forces, just as in the south.³⁶ However, a combination of the persistent air defense 'shield' and heavily fortified rear positions ultimately created a stalemate in the Golan.³⁷ Although Israeli counterattacks pushed Syrian and allied Arab forces back from their start positions to within 24 miles of Damascus, the front stabilized by the middle of the second week of the war and Israeli efforts were increasingly transferred to the Sinai.³⁸

Overall, Israeli Air Force support to ground forces had been compromised by dense Arab air defenses, especially in the early part of the war. However, the Israeli Air Force was not totally ineffective, and it achieved significant successes in other roles. The Israelis maintained clear dominance in air-to-air combat. Exact accounting of losses on each side varies among analyses of the war, but there is broad consensus that kill ratios favored the Israeli Air Force enormously, with estimates ranging from 46:1 to as high as 67:1.³⁹ The extent of Israeli defensive counter air dominance meant that the air force succeeded in its primary mission of securing the homeland against enemy air attack: "...the skies over Israel remained 'clean' throughout the war: not one bomb fell on Israel and Air Force infrastructure remained unaffected."⁴⁰ In addition, the Israeli Air Force continued to mount offensive missions against

³⁵ Dunstan, *The Yom Kippur War*, 201.

³⁶ International Institute for Strategic Studies, "The Middle East War," *Strategic Survey* 74 (April 1974): 18.

³⁷ Lawrence Whetten and Michael Johnson, "Military Lessons of the Yom Kippur War," *The World Today* 30, no. 3 (March 1974): 108.

³⁸ International Institute for Strategic Studies, "The Middle East War," 18.

³⁹ Rabinovich, *The Yom Kippur War*, 497. Herzog, *War of Atonement*, 259.

⁴⁰ Herzog, *War of Atonement*, 260.

deeper targets, including airfields, command and control facilities, and infrastructure targets. These included attacks on Damascus itself, and as a result the majority of Arab air force operations were defensive in nature after 7 October.⁴¹ Despite these successes, however, it was the *difficulties* experienced by the Israeli Air Force, and especially their struggles against Soviet-supplied Arab air defenses, that attracted most analysis in the war's aftermath. The Israeli Air Force lost approximately 100 aircraft in less than three weeks of fighting and struggled to impose itself on the ground battle.⁴² As the war ended, it appeared that the future of tactical air power was in doubt. It seemed that the "missile [had] bent the aircraft's wing."⁴³ Israeli and international observers set to understanding what this meant for the future of air power. For a watching US Air Force, the uncomfortable view was of Soviet missiles bending American-supplied wings.

Post-War Analysis: Academic and International Views

In a presentation on 3 October 1973, British historian Michael Howard spoke of the limitations of "military science," highlighting the difficulty of testing hypotheses in peacetime and the need to rely upon vicarious "fixes" for corrections to military theory outside of major conflict.⁴⁴ Just days after Howard's speech, the outbreak of the Yom Kippur War represented exactly such an opportunity to obtain a vicarious 'fix.' The conflict yielded a great many lessons to a great many observers. Over time, some initial assessments were revised as better

⁴¹ Gordon, "Air Force and Yom Kippur War," 228-229. Raids on Damascus are examined in Rabinovich, *The Yom Kippur War*, 253-268.

⁴² Herzog, *War of Atonement*, 260; Rabinovich, *The Yom Kippur War*, 497; Cordesman and Wagner, *Lessons of Modern War*, 18.

⁴³ Gordon, "Air Force and Yom Kippur War," 222.

⁴⁴ Michael Howard, "Military Science in an Age of Peace," *The RUSI Journal* 119, no. 1 (1974): 3-4.

data became available, and some early hyperbole abated; nonetheless, an enduring set of insights quickly emerged. Of these, a number of commonly identified themes had particular relevance for air power. These themes would influence the US Air Force as it pursued its own internal efforts to understand and react to the war.

Hyperlethality and Attrition

The war demonstrated the lethality of modern battle, with levels of destruction that shocked participants and observers. For example, days of intense fighting in the canal zone concluded with the fall of Egyptian positions to Israeli troops on 18 October:

In the afternoon the minister of defense [Moshe Dayan] arrived on the battlefield with [General] Sharon. As he looked down and saw the scene of destruction... he was visibly shaken. [Israeli Colonel] Amnon said to him, 'Look at this valley of death.' Dayan murmured in astonishment, 'What you people have done here!'⁴⁵

Anti-tank weapons such as the Soviet-manufactured Sagger and RPG-7 took a significant toll on Israeli armor during the first few days of fighting.⁴⁶ Tank guns themselves had increased in range and accuracy, and the combined result of tank/anti-tank lethality was that entire "battalions were consumed on the battlefield in hours."⁴⁷ In addition, the impact of air-launched weapons - especially cluster munitions and the limited Israeli use of guided bombs and Maverick missiles - further contributed to a 'hyperlethal' combat environment.⁴⁸ The consumption

⁴⁵ Herzog, *War of Atonement*, 230.

⁴⁶ Rabinovich, *The Yom Kippur War*, 29; Cordesman and Wagner, *Lessons of Modern War*, 57-60, 64-65.

⁴⁷ Rabinovich, *The Yom Kippur War*, 508.

⁴⁸ Ordnance expenditure statistics: USMEVTI *Trip Report*: Tab A, "Air Force Team Report," Appendix 2.

of equipment, material and manpower during the war was analyzed with barely-concealed incredulity by Martin van Creveld: "...the total count of tanks lost must have approached 3,000... in a conflict that did not last for quite three weeks. The figure is not only much larger than any that ever emerged from a comparable period of time in history; it represents fully one-third of all the tanks that the members of NATO - France included - can muster."⁴⁹

Some observers later downplayed the broader relevance of weapons such as the guided Sagger, pointing to desperate early Israeli tactics that maximized the effectiveness of Arab weapons.⁵⁰ However, the enormous attrition of armored vehicles on both sides told a compelling story in the immediate aftermath of the war. Here, quantity had a narrative quality of its own. The apparent effectiveness of surface-to-air and air-to-air combat systems suggested an equally lethal air environment. The grim reality of these multi-domain killing fields, in which guided weapons offered extremely high probabilities of kill, was summarized by US Army General William DePuy in 1974: "What can be seen, can be hit. What can be hit can be killed."⁵¹

This hyperlethality suggested a growing primacy of defense over offence; however, this did not comfort analysts considering future NATO combat against the Warsaw Pact.⁵² Hypothetical plans for war in Europe relied heavily on armor and aircraft that now looked extremely vulnerable to enemy weapons, even if the same vulnerabilities could be transposed onto Soviet forces. Moreover, the product of the hyperlethality experienced in October 1973 had been extremely high rates of attrition

⁴⁹ Van Creveld, *Military Lessons*, 47-48.

⁵⁰ Herzog, *War of Atonement*, 272; Cordesman and Wagner, *Lessons of Modern War*, 60, 64.

⁵¹ Paul G. Kaminski, "Low Observables: The Air Force and Stealth," in *Technology and the Air Force: A Retrospective Assessment*, ed. Jacob Neufeld, George M. Watson, Jr., and David Chenoweth (Washington D.C.: Air Force History and Museums Program, 1997), 65.

⁵² International Institute for Strategic Studies, "The Middle East War," 55.

and materiel consumption. NATO forces would need to replace battle losses on an unanticipated scale. Attrition and consumption rates were therefore linked areas of serious concern. Martin van Creveld noted:

While details about the rates of consumption and attrition of other items are hard to come by, it is a fact of the greatest significance that both sides... found themselves beginning to run out of ammunition after a single week of murderous but indecisive fighting... [This war has] put a big question mark over [NATO's] ability to wage anything but the shortest of conventional wars. Certainly, rates of attrition cannot be expected to be any less high in a war in Europe; and it would be a tragedy not merely for the West but for mankind if NATO, after holding its own tactically, were to be faced with the choice of either surrendering or initiating a nuclear exchange because of insufficient reserves.⁵³

These concerns were echoed in the annual summary for 1973 produced by the International Institute for Strategic Studies:

...attrition rates were very high indeed - almost certainly higher than those currently used for war planning in Europe - and NATO staffs will need to look again at their stock levels and resupply capacity to see if they are now adequate.⁵⁴

A particular concern was the attrition suffered by the Israeli Air Force during the opening days of the war. The qualitative advantage of the Israeli Air Force had been nullified by both the quality and the quantity of Arab air defenses. The ability of modern ground-based air defenses to contest control of the air was therefore another key issue exposed by the war.

⁵³ Van Creveld, *Military Lessons*, 47-48.

⁵⁴ International Institute for Strategic Studies, "The Middle East War," 52.

Control of the Air and the SAM Threat

In a speech to the Squadron Officer School at Maxwell AFB on 28 November 1973, titled *Some Observations on the Latest Arab-Israeli War*, retired US Air Force Lieutenant General Ira C. Eaker noted that Arab forces had been equipped with the “latest Russian weapons, of the same quality with which Russian front line divisions are equipped... including SAMs of the latest type, mobile [SA-6 systems].”⁵⁵ The resulting confrontation between these missiles and American-built aircraft - “tested” by client forces in a manner that Eaker compared to the use of German and Soviet equipment during the Spanish Civil War - had shown once again the criticality of air superiority in warfare.⁵⁶ The Israeli Air Force had struggled to impose itself over ground battles fought in SAM-defended zones and Israeli armor and infantry losses had been high as a result. The continued relevance of air superiority had been evident in the setbacks suffered by Israeli forces that *lacked* control of the air.

For some, this inability of the Israeli Air Force to establish control of the air was interpreted with a fatalism that questioned the future battlefield utility of aircraft on a fundamental level. Chaim Herzog, a career soldier and later President of Israel, typified this view in his postwar analysis: “The role of the plane in war has changed... To a degree air power will not be as influential as it has been and will affect the battlefield less than it did.”⁵⁷ Herzog’s expanded analysis focused specifically on the close air support mission:

The proliferation of light, portable missiles in the front line means that close support will be the exception to the rule in

⁵⁵ Lt Gen (Ret) Ira C. Eaker, “Some Observations on the Latest Arab-Israeli War,” address, Squadron Officer School, Maxwell AFB, AL, 28 November 1973.

⁵⁶ Lt Gen (Ret) Ira C. Eaker, “Some Observations.”

⁵⁷ Herzog, *War of Atonement*, 261.

future, with the air force being obliged to concentrate on isolating the field of battle, maintaining supremacy in the air and destroying the forces in and near the field of battle.⁵⁸

In some respects, Herzog's comments can be read as a fairly accurate description of later air campaigns, including Desert Storm. Moreover, *contested* close air support remains a difficult task for modern air forces. However, Herzog's conclusions assumed that the missile threat over the battlefield could not be defeated. The 'missing piece of the puzzle' was the possibility that air power could *suppress* enemy defenses and thereby obtain sufficient control of the air to prosecute other missions, including close air support. The Israelis had already recognized the requirement for defense suppression during the War of Attrition, although capabilities had remained limited and circumstances had prevented the execution of suppression missions at the start of the war. Even then, Israeli air and ground forces had effectively suppressed the SAM threat in the Egyptian zone during the war - a development recorded by Herzog but without apparent recognition of its significance.⁵⁹ In addition, Herzog did not allow for improvements in aircraft survivability, such as the employment of effective countermeasures including jamming, chaff and flares. Herzog's analysis, and others like it, betrayed a focus on the first days of the conflict and overlooked later Israeli successes.

The 'true' lessons with onward relevance for control of the air - that ground based air defenses would have to be suppressed or destroyed, and aircraft vulnerability would have to be reduced - were evident in other post-war analyses that transposed the Israeli experience onto potential European conflict. For example, the International Institute for Strategic Studies noted that:

⁵⁸ Herzog, *War of Atonement*, 261.

⁵⁹ Herzog, *War of Atonement*, 232.

The Middle East war showed how effective an air-defense umbrella over ground troops can be, so the heavy Soviet air defenses in Europe clearly have to be reckoned with... There is now likely to be great emphasis placed in the West on the development and deployment of... missiles to suppress air defenses. Weapons which, because of their accuracy, increase the probability of a single-shot kill, thus reducing munitions expenditure and aircraft sortie rates (and hence vulnerability) will attract increased attention as a result of this war.⁶⁰

The Israeli Air Force demonstrated improved capabilities in a well executed operation against Syrian SAM systems in the Bekaa Valley in 1982, obtaining near-total control of the air in a one-sided victory that paralleled the experience of 1967 far more closely than that of October 1973. A watching US Air Force noted these varied Israeli experiences as it improved its own capabilities through the 1970s and 1980s.

Airlift

The Yom Kippur War was not a purely vicarious experience for the US, or the US Air Force. Rather, it was a hybrid experience, with some *direct* American participation. Specifically, the airlift-centric Operation Nickel Grass tested US logistics and power projection capabilities. The logical outcome of lethality and attrition was a critical requirement for resupply. Both the US and the Soviet Union supported their client states with large transfers of materiel during the war.⁶¹

With combat consuming so much materiel so quickly, the speed and reach provided by air resupply capabilities were vital. Martin van Creveld noted “the importance of strategic mobility is definitely one of the

⁶⁰ International Institute for Strategic Studies, "The Middle East War," 55.

⁶¹ International Institute for Strategic Studies, "The Middle East War," 52.

principal lessons to emerge from the Yom Kippur War.”⁶² US Military Airlift Command transported over 22,000 tons of weapons and equipment during Nickel Grass, while the US Air Force and Navy also delivered replacement F-4 and A-4 aircraft.⁶³ This resupply had indirect and direct influences on the prosecution of the war. Israeli confidence was evidently boosted even before the first supplies were received, and ammunition was distributed as soon as it could be unloaded.⁶⁴ Airlift had allowed the Israelis to continue operations despite the lethality and attrition rates of modern combat.

Airlift capabilities were also relevant beyond their immediate impact on the battlefield. The war had represented a superpower confrontation by proxy, and air resupply had supported client states on both sides. The USSR had begun its own resupply airlift as early as October 10 and had transferred an estimated 15,000 tons of equipment to its Arab clients.⁶⁵ Airlift capabilities had thus been an important element in achieving national strategic aims within an indirectly contested region. In this sense, Operation Nickel Grass had reaffirmed the strategic utility of airlift as shown in earlier operations, such as the support of China in the Second World War, and the Berlin Airlift of 1948. It was clear that airlift capabilities were vital both as a response to the lethality/attrition challenges of modern battle, and as a tool of strategic influence.

Towards an Offset Strategy

⁶² Van Creveld, *Military Lessons*, 43.

⁶³ International Institute for Strategic Studies, "The Middle East War," 27.

⁶⁴ David Rodman, "The Impact of American Arms Transfers to Israel during the 1973 Yom Kippur War," *Israel Journal of Foreign Affairs* 7, no. 3 (2013): 111.

⁶⁵ International Institute for Strategic Studies, "The Middle East War," 27; Cordesman and Wagner, *Lessons of Modern War*, 102.

The final overarching lesson was the requirement for qualitative advantages to overcome the challenges of the modern battlefield.⁶⁶ Technology offered the potential to inflict maximum lethality on an adversary while minimizing the rates of attrition sustained. Conversely, technological *inferiority* would incur significant costs, and perhaps even impose defeat. Giora Ram, an Israeli Skyhawk squadron commander in October 1973, observed:

[The outbreak of the war] witnessed one of the watersheds in the history of the air force: technological inferiority. Technological *superiority* had been one of the cornerstones of the Israeli Air Force, and in 1973 the air force had to make a great effort to close the technological gap created by a new type of [threat]... We [had] entered the war at a technological disadvantage.⁶⁷

A variety of technological ‘fixes’, or offsets, were identified as potential solutions to the lethality/attrition challenge. One example was the use of unmanned air vehicles during the war, which had suggested future utility in suppressing air defenses and reconnaissance.⁶⁸ Improved precision guided munitions with increased stand off capabilities promised to maximize own lethality while minimizing exposure to defenses. Passive defenses - for example, armor for tanks, and jamming and countermeasures for aircraft - represented another area of technical innovation that might permit operation on the lethal modern battlefield. Finally, increased levels of situational awareness, along with improved command, control and communications capabilities, would reveal the location of targets and threats and enhance the coordination of own forces.

⁶⁶ Lambeth, *Transformation of American Air Power*, 56.

⁶⁷ Meir Finkel, *On Flexibility: Recovery from Technological and Doctrinal Surprise on the Battlefield*, translated by Moshe Tlamim (Stanford, CA: Stanford Security Studies, 2011), 169-170.

⁶⁸ Van Creveld, *Military Lessons*, 31.

While technological offsets attracted a leading emphasis, observers also noted the *competence* of Israeli forces. Arab combat performance had improved considerably since the Six-Day War, but the Israeli Defense Force had once more shown superior professionalism and fighting ability.⁶⁹ In addition, the Israeli Air Force had once again shown itself near-unassailable in air-to-air combat, and had adjusted to the SAM threat by modifying tactics during the war: “What the captains, majors and flight leaders basically did was to design an entirely new [air-to-ground] fighting doctrine... on the basis of the new reality that we had to find a solution for.”⁷⁰ Training and leadership underpinned such flexibility. US Army General Don Starry, whose influence on US Air Force doctrine is explored in Chapter Four, noted that “battles are yet won by the courage of soldiers, the character of leaders, and the combat excellence of well-trained units.”⁷¹ The professionalism of Israeli air and ground forces was a lesson widely observed - and one with obvious relevance for the post-Vietnam Air Force.

The Yom Kippur War therefore yielded a number of important lessons for postwar observers. The war revealed the unprecedented lethality of the modern battlefield and the associated requirement for vast quantities of materiel in future conflict. Some observers questioned the viability of tactical air power in the immediate aftermath of the war; however, a more pragmatic view was that Western air forces would need to develop means and ways of suppressing SAM defenses and ensuring aircraft survivability. Strategic airlift capabilities would also be vital to the prosecution of future military operations. Finally, observers noted an overarching requirement to pursue qualitative ‘offset’ advantages,

⁶⁹ Anthony H. Cordesman, *The Arab-Israeli Military Balance and the Art of Operations: An Analysis of Military Lessons and Trends and Implications for Future Conflicts* (Washington, D.C.: American Enterprise Institute for Public Policy Research, 1987), 43.

⁷⁰ Giora Ram quoted in Finkel, *On Flexibility*, 171-172.

⁷¹ Starry quoted in Rabinovich, *The Yom Kippur War*, 509.

improving technical capabilities while replicating Israeli training processes and professional competence. These lessons, presented in academic journals and international commentary, foreshadowed the ways in which the US would equip, prepare and indoctrinate its military forces after the disappointments of Vietnam. They also paralleled the conclusions reached by the US Air Force as it conducted its own analysis of the Yom Kippur War.



Chapter 2

The US Air Force and the Yom Kippur War: Processes, Lessons, and Official Conclusions

The Yom Kippur War provided an opportunity for the US Air Force to test its assumptions regarding air power in future conflict. Israeli experience offered a vicarious 'fix' with which to plot a course from Vietnam to America's next war. To find this 'fix', the US Air Force participated in a number of formal initiatives that were coordinated and comprehensive in their intended scope. These included joint, political and single-service missions, and interactions with key Israeli figures. These military analyses informed opinion at senior policy levels. A combination of previously classified reports, correspondence, and policy statements show that lessons identified were broadly aligned with wider Western analysis, and very quickly influenced Air Force capability development in technical and conceptual areas.

The Learning Process

The US Air Force participated in a number of joint and discrete military fact-finding activities after the Yom Kippur War. Immediately following the Arab-Israeli ceasefire of October 24 1973, Secretary of Defense James R. Schlesinger mandated the creation of a joint military team to go to Israel to identify the pertinent lessons of the conflict.¹ In a responding memorandum of October 30, the Chairman of the Joint Chiefs of Staff, Admiral T. H. Moorer, outlined the aims and composition

¹ Adm T.H. Moorer, Chairman, Joint Chiefs of Staff, to Secretary of Defense, memorandum, 30 October 1973, Enclosure B. Document is now declassified.

of the mission, titled the *United States Military Operational Survey Team* (USMOST):

The team [will] be comprised of Joint Staff, DIA [Defense Intelligence Agency], and Service representatives with the express purpose of determining first-hand the operational lessons from the Middle-East Arab-Israeli conflict. These lessons learned could be invaluable in our constant effort to maintain the best possible defense posture against potential enemies.²

The USMOST comprised three members of the Joint Staff, four members from each of the US Army and US Air Force, two from each of the US Navy and US Marine Corps, one member of US European Command, and one member of the Defense Intelligence Agency (DIA).³ The team was tasked to place “special emphasis [upon] weapons system effectiveness and operational tactics.”⁴ The USMOST would interact with a DIA technical intelligence team that had already been established in Israel, codenamed Druid Grove.⁵ The USMOST was viewed as “the first increment of a lessons learned program that will extend over a period of time with some portions done in Israel and some in the United States.”⁶ The team’s terms of reference outlined several areas of interest to the Air Force, including: Israeli coordination between air and ground forces during close air support and air defense missions; Israeli Air Force air-to-air and air-to-ground effectiveness; lessons regarding the employment of specific ordnance, including the AIM-7 and Maverick missiles; SAM suppression and the effectiveness of countermeasures, with particular emphasis on the SA-3, SA-6 and SA-7 systems that the US had limited

² Moorer to Secretary of Defense, memorandum, Enclosure B.

³ Moorer to Secretary of Defense, memorandum, Enclosure A.

⁴ Moorer to Secretary of Defense, memorandum, Enclosure A.

⁵ Joint Chiefs of Staff, United States Military Equipment Validation Team (USMEVTI), *Trip Report to Israeli Defense Forces 28 October – 8 November 1973*, 1973, vii. Document is now declassified.

⁶ Moorer to Secretary of Defense, memorandum, Enclosure A.

or no direct experience with in Vietnam; electronic warfare; and lessons regarding command, control and communications.⁷

The USMOST was also charged with the “examination of captured military equipment, selection and designation of specific equipment for shipment to the United States, and on-the-spot technical intelligence analysis.”⁸ This focus on the assessment and potential transfer of captured equipment was a natural extension to discussions between US and Israeli officials during the war: Henry Kissinger had quizzed Israeli Air Force Chief of Staff Major General Binyamin Peled about missile effectiveness and the Israeli capture of SA-6 equipment during a meeting in Israel on 22 October.⁹ The USMOST therefore deployed with a comprehensive ‘shopping list’ of areas of interest, including many with specific relevance for the US Air Force. These focused on operational and tactical issues but in support of the *strategic* aim of maintaining US defense capabilities relative to potential adversaries, with an implicit emphasis on the USSR.

The USMOST was not the only joint team to deploy to Israel immediately after the end of the war. A parallel, equipment-focused team stood up with the purpose of validating Israeli materiel losses during the conflict and short term resupply requirements.¹⁰ Importantly, this team - named the *US Military Equipment Validation Team, Israel*, or USMEVTI - was scheduled to arrive in Israel before the USMOST. As a result, the USMEVTI was dual-tasked with additional responsibility for compiling ad-hoc weapons effectiveness reviews for transfer to the USMOST once the latter arrived in theater.¹¹ As a specific example of such cooperation, the USMEVTI was directed to “determine weapons

⁷ Moorer to Secretary of Defense, memorandum, Enclosure A.

⁸ Moorer to Secretary of Defense, memorandum, Enclosure A.

⁹ Henry A. Kissinger, Secretary of State, memorandum of conversation, 22 October 1973. Document is now declassified.

¹⁰ USMEVTI *Trip Report*, i.

¹¹ USMEVTI *Trip Report*, vii.

effectiveness data as available from tank/equipment carcasses and field visits, and report this to the Druid Grove team for correlation until the [USMOST] augmentation personnel are in place.”¹² The USMEVTI, USMOST and Druid Grove teams were thus directed to work together, transferring and supplementing information while avoiding duplication.¹³ The USMEVTI was headed by US Air Force Major General Maurice F. Casey, who was supported by a US Army brigadier general, two US Air Force colonels, and two US Navy captains, with a further 15 junior and civilian staff.¹⁴ The US Air Force was therefore quickly involved in two mutually supporting joint teams in Israel and had been allocated the mission lead for one of these, the USMEVTI.

The Air Force also participated indirectly in lesson-learning via political initiatives. The Air Force was allocated a facilitating and ‘chaperone’ role in the visit of a subcommittee of the House Armed Services Committee to the Middle East in November 1973. US Air Force Major General M. L. Boswell accompanied the visiting Congressmen, who toured not only Israel but also Egypt in order to “meet with National decision makers, discuss tactics and weapons with military leaders, and to observe first-hand the impact of the 6 October war.”¹⁵ The group met military and political leaders on each side, including Israeli Prime Minister Golda Meir and Egyptian President Anwar Sadat. A confidential summary report was subsequently sent to the Secretary of the Air Force and the Chief of Staff.¹⁶ In its involvement with this House visit, the Air Force obtained insights into the experiences of both sides in the conflict at the highest political and military levels.

¹² USMEVTI *Trip Report*, vii.

¹³ USMEVTI *Trip Report*, vii.

¹⁴ USMEVTI *Trip Report*, viii-ix.

¹⁵ House Armed Services Committee, to Secretary of the Air Force, memorandum, 29 November 1973, 2. Document is now declassified.

¹⁶ House Armed Services Committee to Secretary of the Air Force, memorandum, 2.

Beyond these joint and political missions, the Air Force also undertook discrete, single service initiatives. On 30 October 1973, Secretary of the Air Force John L. McLucas suggested the Air Force Policy Council meet to address the lessons of the Yom Kippur War.¹⁷ Accepting that analysis would be incomplete so soon after the conflict, McLucas was nonetheless keen to ensure “the most significant conclusions having broader application to Air Force concerns are incorporated into our planning and budgetary process promptly... in such area as R&D, weapons acquisition, basing, training, deployment, employment and intelligence.”¹⁸ The Air Force Directorate of Operations in the Pentagon responded by producing a number of ‘talking papers’ that addressed specific areas of interest. One of the members of staff tasked with this analysis was then-Lieutenant Colonel C. A. Horner, who penned summaries covering “Mid East War Data Support of USAF Programs” and “Interdependence of Air and Ground Operations.”¹⁹ Not only was the Air Force learning as an *organization*, but key personnel were interpreting the conflict as *individuals*, and drawing conclusions with long-term relevance. This theme is further explored - with ‘Chuck’ Horner as a developed example - in Chapter Four.

Coincident with this work in the Pentagon, the Air Force Tactical Fighter Weapons Center formed a Middle East working group to “collect and evaluate tactics information available on the October 1973 conflict in the Middle East.”²⁰ The working group comprised three panels, one each for air-to-ground, air-to-air and surface-to-air lessons. Each panel

¹⁷ John L. McLucas, to Chief of Staff U.S. Air Force, memorandum, 30 October 1973. Document is now declassified.

¹⁸ McLucas to Chief of Staff U.S. Air Force, memorandum.

¹⁹ Lt Col C.A. Horner, Directorate of Operations, Air Staff Talking Papers, subjects: Mid East War Data Support of USAF Programs; Inter-dependence of Air and Ground Operations, 24 November 1974. Documents are now declassified. Horner would go on to be Joint Force Air Component Commander during Operation Desert Storm.

²⁰ Message, 091840Z NOV 73, US Air Force, to Tactical Fighter Weapons Center, 9 November 1973. Document is now declassified.

developed a broad range of tactical questions within a number of defined areas of interest. Questions posed for fighter tactics included the effects of electronic counter measures on radar proximity weapons fuzing; weapon-to-target matching issues for specific target sets; and Israeli experiences with laser and electro-optically guided munitions.²¹ Areas of interest for electronic countermeasures included jamming and threat detection; chaff tactics used against the SA-6; the use of 'drones', including whether or not Arab forces attempted to jam ground control signals; and the number of SAMs fired at Israeli unmanned vehicles - the latter question suggestive of a developing program to explore the use of unmanned aircraft as decoys in saturation tactics against the growing SAM threat.²² The working group's charter was later extended beyond "combat specific" issues to include reconnaissance, airlift, and command and control.²³

Finally, Air Force leaders made direct contact with their Israeli counterparts in an effort to understand the air power lessons of the war. General Robert J. Dixon, commander of Tactical Air Command, met directly with Israeli General Peled in March 1974.²⁴ Dixon spent twelve hours in discussion with Peled, including some joint sessions with General William DePuy, head of US Army Training and Doctrine Command.²⁵ Dixon and Peled would go on to establish an enduring professional relationship that influenced Dixon's later changes to Air Force training.²⁶ These early meetings complemented other Air Force

²¹ Message, 091840Z NOV 73.

²² Message, 091840Z NOV 73.

²³ Col William H. Laseter, to Tactical Fighter Weapons Center, memorandum, 23 November 1973. Document is now declassified.

²⁴ Gen Robert J. Dixon, Commander, Tactical Air Command, to Gen George S. Brown, Chief of Staff, United States Air Force, letter, 12 March 1974. Document is now declassified.

²⁵ Dixon to Brown, letter.

²⁶ Marshall L. Michel, "The Revolt of the Majors: How the Air Force Changed After Vietnam," PhD diss., Auburn University, 2006, 7, 186.

initiatives to understand the conflict in the first months after its conclusion.

The US Air Force had clearly concluded that the Yom Kippur War offered a useful glimpse into future force-on-force combat, and directed a range of 'in house' analyses to provide an air-focused view that would complement joint efforts. Air Force efforts to analyze the war were therefore wide ranging in composition and focus. Air Force personnel participated in complementary joint, political, single-service and individual learning processes. Subsequent reports and correspondence showed that the resulting conclusions were broadly aligned with interpretations of the war in external analyses and literature.

US Air Force Findings

The resulting US military analyses of the Yom Kippur War are only partially declassified. The USMOST report, for example, remains unavailable. However, a large amount of material is accessible. The USMEVTI report - which, as noted above, was compiled in conjunction with the USMOST and the DIA - was declassified in 1982 and, in accordance with its secondary operational focus, retained a useful amount of analysis beyond the recording of raw materiel statistics. Other integrated learning processes yielded a variety of reports, correspondence and talking papers. Taken together, this material presented a range of findings, comparable to external narratives of the war and with a clear emphasis on the challenges posed by modern air defense systems.

Lethality and the SAM threat

The US Air Force was evidently keen to understand precise aircraft loss rates and causes in order to expose the threat posed by layered air

defenses. Here, the USMEVTI fulfilled its secondary function of compiling operational data by reporting on Israeli F-4 and A-4 losses, the former contained within Air Force analysis and the latter compiled by the US Navy, the domestic operator of the Skyhawk. Table 1 relates the USMEVTI summary of total aircraft losses by cause.

Table 1: Israeli F-4 and A-4 Losses by Cause, 6 -24 October 1973.

Aircraft Type	Cause of Aircraft Loss						Total
	SAM	AAA	SAM+AAA	SA-7+AAA	Enemy Aircraft	Unknown	
F-4E	9	9	1	1	3	9	32
A-4	29	12	3	No data	No data	9	53

Source: USMEVTI *Trip Report*, Composite Data.

SAM systems accounted for approximately half of all losses, either alone or in combination with AAA. Moreover, Israeli combat reports suggested many of the AAA losses were suffered by aircraft flying low to avoid radar-guided SAMs.²⁷ In addition, the USMEVTI report contained some data for aircraft damaged, rather than destroyed, by SAMs: 26 A-4 Skyhawks were damaged by the SA-7 during the war but returned to Israeli airfields.²⁸ It seems reasonable to assume that a percentage of losses in the ‘unknown’ category were also due to air defenses, or - in view of coalition experience during the Gulf War in 1991 - controlled

²⁷ For example, route planning over the Golan Heights on 7 October exposed Israeli Phantom formations to concentrated Syrian AAA. Mission reports emphasized the volume and effectiveness of ground fire. Shlomo Aloni, *Ghosts of Atonement: Israeli F-4 Phantom Operations During the Yom Kippur War* (Atglen, PA: Schiffer, 2015), 45.

²⁸ USMEVTI *Trip Report*: Tab B, “Navy Team Report,” Israeli Air Force A-4 Missions and Battle Damage Survivability.

flight into terrain while avoiding threats at low level. Israel also lost a number of French-made aircraft and helicopters to causes that are not outlined in the USMEVTI report, and it is again reasonable to assume that some of these were destroyed by SAMs and AAA guns.²⁹ Finally, Arab air-to-air claims far outweighed the three losses Israel admitted to, but even allocating all of the 18 ‘unknown’ losses to Arab aircraft would derive only 21 kills, just one-quarter of the total.³⁰ Overall, the USMEVTI data showed that surface defenses had accounted for the clear majority of Israeli air losses, even if ‘unknown’ causes of destruction were attributed entirely to Arab fighters.

The USMEVTI report provided further data concerning Israeli losses. The report summarized overall sortie numbers and attrition by day and, for the A-4, by geographical zone. This data showed that loss ratios had varied considerably throughout the war. Israeli losses had indeed been high at the start of the conflict - especially on the ‘black’ day of 7 October - but had then abated due to improved Israeli tactics and suppression operations. For instance, F-4 statistics for 7 October revealed unsustainable loss rates. Israeli Phantoms flew 187 sorties for the loss of seven aircraft destroyed plus two with major damage, with an additional 14 receiving minor damage.³¹ These figures are summarized in Table 2.

²⁹ Henry A. Kissinger, Secretary of State, memorandum of conversation, 9 October 1973. Document is now declassified.

³⁰ Tom Cooper et al, *Arab MiGs Volume 5: October 1973 War: Part 1* (Houston, TX: Harpia Publishing, 2014), 7.

³¹ USMEVTI *Trip Report*: Tab A, “Air Force Team Report,” Appendix 1.

Table 2: Israeli F-4 Sorties and Attrition, 7 October 1973.

Aircraft Type	Sorties Flown	Aircraft Destroyed	Major Damage	Minor Damage
F-4E	187	7	2	14

Source: USMEVTI *Trip Report*, Composite Data.

These figures equated to a loss ratio of 3.7 percent, or 4.8 percent including aircraft that suffered major damage, and a total ratio of lost/damaged aircraft of 12.3 percent. Expressed with reference to the number of airframes possessed by the Israeli Air Force, rather than total sortie numbers, the figures were even more stark. The Phantom force comprised 85 aircraft on 7 October, so the loss of seven destroyed and two severely damaged - nine aircraft - represented over ten percent of the total. Overall, a staggering 27 percent of available F-4 aircraft had suffered at least minor damage on this single day.

A-4 statistics were similar. In 278 sorties flown on 7 October, Israel lost 10 Skyhawks destroyed, four severely damaged, with a further 22 suffering minor damage.³² These statistics are presented in Table 3.

Table 3: Israeli A-4 Sorties and Attrition, 7 October 1973.

Aircraft Type	Sorties Flown	Aircraft Destroyed	Major Damage	Minor Damage
A-4	278	10	4	22

Source: USMEVTI *Trip Report*, Composite Data.

³² USMEVTI *Trip Report*: Tab B, "Navy Team Report," Appendix 1, Addendum c.

The resulting ratios were very similar to those of the F-4 force - 3.6 percent destroyed, 5 percent destroyed/severely damaged, and a total ratio of 12.9 percent lost or damage to some extent. These losses were from a larger force of 230 aircraft, and so losses as a percentage of airframes were lower than for the F-4, at 6 percent lost or severely damaged. Altogether, approximately one in six Skyhawks, and one in four Phantoms, had been hit on a single day - a 'black day' indeed.

These loss rates were not sustainable, and in the event they were not sustained.³³ The Israelis adapted their operations to minimize attrition and air power contributed to the favorable military situation that prevailed on both fronts when the ceasefire went into effect on 24 October 24. The USMVETI report showed that only two Phantoms were lost during the final five days of F-4 operations, 15 to 19 October.³⁴ An additional eleven suffered major or minor damage. Sorties over the period totaled 890; the loss ratio in this period was thus a mere 0.3 percent, with aircraft suffering some degree of damage on only 1.6% of sorties flown. This was an approximately tenfold reduction in attrition from 7 October. Nor had the F-4s simply avoided frontline areas; this five-day period included the attack across the Suez by Israeli ground forces and provision of air support to those armored formations. Reduced attrition reflected the increased operational freedom that the air force had enjoyed once Egyptian SAMs had been destroyed or forced to withdraw.

A-4 losses in the same period told a complementary, but more nuanced, story. Total Skyhawk losses between 15 and 19 October were nine aircraft from 947 sorties, or 0.95 percent, another huge reduction from 7 October. However, the USMEVTI report recorded A-4 figures

³³ Martin Van Creveld, *The Sword and the Olive: A Critical History of the Israeli Defense Force* (New York: Public Affairs, 1998), 233.

³⁴ USMEVTI *Trip Report*: Tab A, "Air Force Team Report," Appendix 1.

sorties and losses by front, and the figures showed stark contrasts between the Egyptian and Syrian zones. For example, no Skyhawks were lost on 17 October on the Egyptian front from 155 sorties flown, but on the Syrian front - where air defenses remained largely intact - two aircraft were destroyed across only nine sorties.³⁵ The apparent Israeli response to this was to suspend A-4 operations on the Syrian front, with just four sorties flown during the subsequent three days. This data illustrated the difference between operating against partially suppressed defenses on the Egyptian front and the intact air defense 'umbrella' that was maintained by the Syrians until the end of the war.

Detailed USMEVTI examination of air attrition therefore revealed significant variations in loss rates across the different zones and phases of the war. This data did not support early hyperbole declaring the demise of the tactical aircraft in modern war; rather, the apparent lesson was that modern ground-based air defenses must be degraded, as part of the control of the air task, in support of tactical air operations. The USMEVTI report concluded that: "The enemy's improved capabilities and massive use of surface-to-air missiles has shifted the balance over the battle arena. Improved air delivered munitions and modern electronic countermeasures are needed to insure [sic] support of the ground forces."³⁶ The Air Force Directorate of Operations agreed, with talking papers pointing to the need for electronic warfare platforms, modern countermeasures, and further development of Wild Weasel attack aircraft.³⁷

Direct contact between US Air Force officers and Israeli leaders corroborated these findings. General Peled observed during meetings with the House Armed Services Committee in Israel that control of the air

³⁵ USMEVTI *Trip Report*: Tab B, "Navy Team Report," Appendix 1, Addendum c.

³⁶ USMEVTI *Trip Report*: Tab A, "Air Force team report," 9.

³⁷ Horner, *Mid East War Data*; Capt G.W. Dixon, Directorate of Operations, Air Staff Talking Paper, subject: Israeli Electronic Countermeasures (ECM), 21 November 1973. Document is now declassified.

requirements had changed: “[the] first priority in battle is to go after the ground-to-air capability.”³⁸ Peled maintained this view in his March 1974 meetings with General Dixon, outlining a sequential approach in which medium altitude radar SAMs should be suppressed first, followed by AAA defenses, after which “CAS [could] then be done effectively.”³⁹ The challenges facing tactical aircraft had increased, but Israeli data and senior opinion firmly suggested this did not mean an end to the attack aircraft as a viable battlefield asset. Rather, suppressive techniques and counters could be found, and these should be a focus for development.

These judgments were further reflected in a later Department of Defense report to Congress, *The Effectiveness of United States Military Aid to Israel*, in December 1974. The report noted the “initial reaction to early Israeli losses was to suppose that systems like the SA-6, SA-7, and ZSU-23-4 could... prevent [tactical aircraft] from flying effective attack air support against defended ground forces.”⁴⁰ However, the Israeli Air Force had not trained its personnel to use American ECM equipment, and nor had it briefed or prosecuted suppression missions effectively.⁴¹ Further, “the IAF did not attempt to employ US air-to-surface guided missiles extensively in defended areas during the war [and] lacked the command and control and targeting capability to identify and hit the enemy ground force targets using such systems without overflight of the potential target and its air defenses.”⁴² The conclusion was clear; Israeli air operations had been compromised because Arab air defenses had not been effectively suppressed or countered, and not because ‘the missile

³⁸ House Armed Services Committee to Secretary of the Air Force, memorandum, 7.

³⁹ Dixon to Brown, letter, attachment, 1.

⁴⁰ Department of Defense, *The Effectiveness of United States Military Aid to Israel (ISMILAIID): Report by the Secretary of Defense to the Congress in Compliance with PL 39-199* (Washington, D.C.: Department of Defense, December 1974), 35. Document is now declassified.

⁴¹ Department of Defense, *ISMILAIID Report*.

⁴² Department of Defense, *ISMILAIID Report*, 36.

had bent the aircraft's wing' in any insurmountable sense. Where Israel had managed to suppress defenses with air or ground formations, the air force had been able to support army elements. Improved suppression capabilities and survivability could, it seemed, 'unbend' the aircraft's wing.

Attrition and Materiel Consumption

Beyond the focus on the control of the air mission and modern ground-based threats, initial US analysis also recorded findings in other areas that broadly corresponded with wider, unofficial observations. The consequences of the hyperlethal battlefield - heavy attrition of resources and enormous rates of materiel consumption - were highlighted, and suggested the US would require both better, and *more*, equipment in future. The USMEVTI report recorded the Israeli F-4 force started the war on October 6 with 86 operational aircraft.⁴³ By 15 October, as the first US replacements arrived, the Israeli Air Force had been reduced to 59 operational Phantoms - a reduction of 31 percent in a mere ten days. The US Air Force noted these reductions in operational readiness rates and extrapolated them onto a potential European war, noting that comparable attrition would expend US air forces in approximately two weeks.

Israeli aircraft attrition also affected American readiness levels, creating a *direct* impact via an *indirect* combat experience. The official TAC history for July 1973 to July 1974 recorded TAC deliveries of 34 F-4Es to Israel between 14 and 21 October.⁴⁴ As a result, the deployment capability of one American F-4 wing was compromised - one squadron was left with no aircraft, while a second was considered capable of

⁴³ USMEVTI *Trip Report*: Tab A, "Air Force Team Report," Appendix 1.

⁴⁴ History, Tactical Air Command (TAC), July 1973 to July 1974, Vol 1, 92. Document is now declassified.

carrying out only some of its wartime missions.⁴⁵ American strength had therefore been eroded by Israeli attrition. Here, the US could extrapolate future force structure requirements based not only on Israeli combat attrition in October 1973 but also projected resupply commitments to allies.

Finally, air-delivered ammunition usage recorded by the USMEVTI was extremely high. The Israeli Air Force dropped its entire inventory of CBU-58 cluster bombs plus another 1,601 of 2,460 replacement munitions provided by the US, finishing the war with only 859 CBU-58 versus a prewar supply of 4,670.⁴⁶ The Israelis also fired 175 of 276 AIM-9 missiles and 49 of 106 AIM-7 Sparrows. The Shrike anti-radiation missile was also heavily employed, with 197 fired, in excess of pre-war stocks that had totaled just 145. Modern combat had indeed consumed large quantities of materiel and ammunition, and this was noted by the US Air Force in anticipation of revising its own stock levels. The Operations Directorate related Israeli statistics to US Air Force holdings, concluding that “current US stocks do not meet requirements”, especially for air intercept and anti-radiation missiles.⁴⁷ USAFE required 60 days of stocks but only held enough for 30 days of fighting.⁴⁸ With more than a little understatement, the Operations Directorate report concluded the “US cannot afford to ‘run out.’”⁴⁹

The Yom Kippur War therefore showed that the Air Force would need to assume high levels of materiel attrition and munitions employment in modern conflict. Issues of quantity played into discussions regarding the optimum high/low force balance proposed

⁴⁵ TAC History, 93.

⁴⁶ USMEVTI *Trip Report*: Tab A: “Air Force Team Report,” Appendix 2.

⁴⁷ Lt Col W.D., Telford, Directorate of Operations, Air Staff Talking Paper, subject: Need for War Reserve Materiel (WRM) Munitions Stockpile, 21 November 1973. Document is now declassified.

⁴⁸ Telford, Need for War Reserve Materiel.

⁴⁹ Telford, Need for War Reserve Materiel.

between the new F-15 and the developmental Lightweight Fighter candidate, the YF-16.⁵⁰ It was clear the US would need not only capable aircraft, but *numerous* aircraft, along with greater quantities of consumable stocks - an important observation as the US military contracted in 'normal' post-war fashion after the end of its involvement in Vietnam.⁵¹

Technological Offsets

The US Air Force identified a number of technological counters to the issues of surface threats and lethality. These included guided and standoff weaponry, countermeasures, and other aspects of aircraft survivability. The Air Force Operations Directorate recorded Israeli experiences with the AGM-65 Maverick air-to-ground missile. Fifty Mavericks were fired by the Israelis against vehicles and fortified positions, with 39 hits, one near miss, seven misses and three failures.⁵² These results were interpreted as "quite impressive" in the 1975 Department of Defense Annual Report.⁵³ Pentagon talking papers also revealed weapons systems effectiveness figures for Walleye and Mark 84 electro-optically guided munitions, with success rates of 96 percent from 88 releases for the former and 78 percent from 32 releases for the guided

⁵⁰ TAC History 119-120; Schlesinger to Senate, 5 February 1974, *Fiscal Year 1975 Authorization for Military Procurement, Research and Development, and Active Duty, Selected Reserve, and Civilian Personnel Strengths: Hearings before the Committee on Armed Services, United States Senate*, 93rd Cong., 2nd sess., 1974, 116.

⁵¹ TAC History, v-vi.

⁵² Mr Bachmann, Directorate of Operations, Air Staff Talking Paper, subject: Maverick Use in Mid-East War, 21 November 1973. Document is now declassified.

⁵³ Department of Defense, *Report of the Secretary of Defense James R. Schlesinger to the Congress on the FY 1975 Defense Budget and FY 1975-1979 Defense Program, March 4, 1974* (Washington, D.C.: U.S. Government Printing Office, 1974), 152.

Mark 84.⁵⁴ Israeli opinion expressed the utility and desirability of the standoff and high probability of kill these weapons offered. Lt Gen David Elazar, the Israeli Chief of the General Staff, informed the House Armed Services Committee that he perceived “an urgent requirement for stand-off missiles.”⁵⁵ Elazar was backed by General Peled who “came on strong” in pressing the need for standoff weapons.⁵⁶ Peled also informed General Dixon in March 1974 the Israeli Air Force had not possessed enough electro-optically guided munitions and had often been forced to rely on less effective unguided cluster bombs, released in low level loft attacks.⁵⁷ The USMEVTI recorded a stated Israeli requirement for “a stand-off (25-40 miles) weapon which can assure destruction of mobile SAM-6 installations.”⁵⁸ Peled also confirmed Israeli satisfaction with Maverick but expressed a desire for improved AGM-45 Shrike anti-radar missiles or an equivalent.⁵⁹ The Pentagon talking papers were silent on Shrike but noted that an improved Wild Weasel variant of the F-4 would offer the advantage of carrying the AGM-78 Standard anti-radar missile.⁶⁰ Implied Israeli criticism of the Shrike and corresponding US Air Force observations suggested some dissatisfaction with existing anti-radiation missile capabilities.

Air Force findings also addressed aircraft countermeasures and survivability. The USMEVTI report noted the utility of chaff as a defensive aid against radar-guided SAM systems and the implications of not having this countermeasure available to all Israeli aircraft: “It may

⁵⁴ Lt Col Blake, Directorate of Operations, Air Staff Talking Paper, subject: Walleye Mod I Success in Mid-East, 21 November 1973. Document is now declassified.

⁵⁵ House Armed Services Committee to Secretary of the Air Force, memorandum, 5.

⁵⁶ House Armed Services Committee to Secretary of the Air Force, memorandum, 5, 7.

⁵⁷ Dixon to Brown, letter, attachment, 2.

⁵⁸ USMEVTI *Trip Report*: Tab A, “Air Force Team Report,” 9.

⁵⁹ Dixon to Brown, letter, attachment, 4, 6.

⁶⁰ Horner, Mid East War Data, 2.

be significant that the most numerous A-4 type loss was the A-4H which does not have the ALE-29 [countermeasures dispenser] and thus cannot use... chaff.”⁶¹ The report also noted only 30 radar warning receivers were available for the prewar fleet of Israeli Skyhawks, concluding: “The quantities of ECM equipment presently on hand in the Israeli Air Force are not sufficient to prevent large losses in the SAM environment.”⁶² Operations Directorate analysis supported these views, noting the ‘successful performance of self-protection pods and chaff’ and also recording Israeli pilot observations that “the SA-6 homed in on the self-protection chaff rather than the target aircraft.”⁶³

Other survivability issues were also noted. The faster A-4N variant of the Skyhawk had suffered comparatively few losses to SA-7 due its top speed of 550 knots. The small warhead of the SA-7 also tended to damage rather than destroy aircraft, typically causing tail damage as it homed on the hottest part of the aircraft’s infrared signature. The Israelis countered this by extending the Skyhawk tail pipe to move any damage further aft and away from the aircraft’s engine.⁶⁴ Conflicting requirements of speed and ruggedness would drive controversy surrounding the US Air Force A-10 program; however, the Israeli experience clearly demonstrated that aircraft could be optimized to avoid or survive hits by modern missile systems.⁶⁵

Air Force reports noted the utility of electronic jamming, both by standoff platforms and via self-protection pods carried by attack aircraft. The Operations Directorate assessed the Israeli use of helicopters in the standoff jamming role as ‘effective when properly employed’, especially

⁶¹ USMEVTI *Trip Report*: Tab B, “Navy Team Report,” Israeli Air Force ECM Loss Validation.

⁶² USMEVTI *Trip Report*: Tab B, “Navy Team Report,” Israeli Air Force ECM.

⁶³ Horner, *Mid East War Data*, 3; Dixon, *Israeli Electronic Countermeasures*, 1.

⁶⁴ USMEVTI *Trip Report*: Tab B, “Navy Team Report,” Israeli Air Force A-4 Missions and Battle Damage Survivability.

⁶⁵ TAC History, 152, 157.

against SA-2 and SA-3 acquisition radars, with the Israelis reporting losses were lower during missions when these supporting assets were deployed “close to victim radars, but outside the SAM lethal range.”⁶⁶ However, the SA-6 had been a major problem. The Israelis had not enabled experimental electronic warfare pod techniques for fear that the semi-active SA-6 missile might home on the jamming signals.⁶⁷ The later recollections of a USAFE officer provided more detail on this issue: the “Israelis wanted to know which settings we used to counter the SA-6 system. We gave them what we had, a setting... intended to distract the missile’s COW [continuous wave] seeker head. But... the Israelis decided not to use our setting. They were afraid the jamming pod would act as a beacon and they were unwilling to take the chance.”⁶⁸ Senior Israeli remarks to American officials corroborated the utility of jamming and protective technologies but also emphasized the need for improved capabilities. Maj Gen Peled remarked that extensive use of helicopter standoff jamming had been effective during suppression attacks, but Lt Gen Elazar noted the Israelis had “no good answer now to the SA-6.”⁶⁹

The Air Force also benefitted from access to captured Soviet equipment made available for American testing. The House Armed Services Committee visitors and their Air Force escorts were shown a display of captured Soviet equipment.⁷⁰ The US obtained SA-7 systems from Israel and used this equipment in tests against aircraft under development, including the A-10 and F-15.⁷¹ Some reports indicated the additional transfer of SA-6 systems or components to the US for similar

⁶⁶ Dixon, *Israeli Electronic Countermeasures*, 1.

⁶⁷ Dixon, *Israeli Electronic Countermeasures*, 1.

⁶⁸ Lt Col Dave Brog, quoted in Cooper et al, *Arab MiGs: Vol 5 Part 1*, 152.

⁶⁹ Dixon to Brown, letter, attachment, 1-2; House Armed Services Committee to Secretary of the Air Force, memorandum, 5.

⁷⁰ House Armed Services Committee to Secretary of the Air Force, memorandum, 2.

⁷¹ General Evans to Senate, *Hearings before the Committee on Armed Services*, 1078.

testing and evaluation purposes.⁷² Access to Israeli data and experience, and ‘hands on’ examination of captured Soviet equipment, allowed the US Air Force to assess current defensive capabilities against modern threats. Findings pointed to significant challenges, but also a viable range of technological counters.

Conceptual Offsets

Beyond technological offsets, US Air Force analysis noted the relevance of Israeli conceptual and operational procedures. American observers believed professional competence and training were integral to the outcome of the war. The Israelis felt superior training had been critical, especially in view of improved Arab battlefield performance in comparison to the Six-Day War of 1967.⁷³ General Dixon recorded the experience and training habits of the Israelis after his March visit with General Peled. The Israeli Air Force flew an average of 25 hours per month in training and had an average experience level of 1,500 flight hours.⁷⁴ During low level attacks against Arab positions, Israeli pilots had flown as low as 20 feet - a demanding and fatiguing skill that demanded extremely high proficiency.⁷⁵ Dixon concluded that, in addition to good equipment, “training - then tactics and guts as these are magnified by the real survival urge - are the keys to success.”⁷⁶ The Operations Directorate supported these views, noting that in air-to-air engagement outcomes ‘superior training’ had been a critical factor in Israeli success.⁷⁷ These assessments matched those of external

⁷² Marshall L. Michel, “The Revolt of the Majors: How the Air Force Changed After Vietnam,” PhD diss., Auburn University, 2006, 185.

⁷³ House Armed Services Committee to Secretary of the Air Force, memorandum, 5, 7.

⁷⁴ Dixon to Brown, letter, attachment, 6.

⁷⁵ Dixon to Brown, letter, attachment, 5.

⁷⁶ Dixon to Brown, letter, 4.

⁷⁷ Horner, Interdependence, 3.

observers; the quality of Israeli personnel - not merely their American-provided equipment - had been an important lesson of the war.

Airlift

Finally, the US Air Force analyzed its own airlift efforts and identified requirements to enhance these capabilities in the future. Operation Nickel Grass had delivered 22,395 tons of materiel in 556 missions.⁷⁸ The C-5, which had proven controversial during its development and acquisition, had been “particularly effective”, delivering nearly half the total tonnage in only 25 percent of the total sorties.⁷⁹ Israeli leaders directly commended the US airlift, and specifically the contribution of the C-5, during the House Armed Services Committee visit in November 1973.⁸⁰ Moreover, the Operations Directorate reported - in an understandably satisfied tone - “US airlift required 42 percent fewer sorties to deliver 47 percent more tonnage over nearly 4 times as great a one-way distance” as the parallel Soviet resupply of the Arab states.⁸¹ Israeli leaders directly commended the US airlift, and specifically the contribution of the C-5, during the House Armed Services Committee visit in November 1973.⁸² However, this success had relied upon the availability of Lajes as a refueling airfield. The C-141, which had been the workhorse of the operation, could not fly unrefueled between the US and Israel and also lacked an air-refueling capability. The Operations Directorate report recommended “more C-5 wide body

⁷⁸ Maj R.H. Baxter, Directorate of Operations, Air Staff Talking Paper, subject: Importance of Strategic Airlift, 24 November 1973, 1. Document is now declassified.

⁷⁹ Baxter, Importance of Strategic Airlift.

⁸⁰ House Armed Services Committee to Secretary of the Air Force, memorandum, 4.

⁸¹ Baxter, Importance of Strategic Airlift, 2.

⁸² House Armed Services Committee to Secretary of the Air Force, memorandum, 4.

type aircraft”, air refueling capabilities and training for the C-141 force, and also a new tanker with which to support future airlift operations.⁸³ Nickel Grass had been a success, especially for the new C-5, but the US Air Force also knew improvements would be required for future operations of similar or larger scale.

Official Conclusions

Joint and air force analysis informed early assessments of the Yom Kippur War at the policy level. Preliminary lessons were identified by a number of senior defense officials during the annual budget process completed in early 1974. Collectively, their tone confirmed prior suspicions in many areas: the lessons of Vietnam had been complemented by the vicarious experience of October 1973. However, the *scale* of the challenges experienced by the Israelis had been surprising, and the US military faced significant challenges in preparing for future conflict.

Regarding the ‘headline’ issues of lethality and aircraft survivability, senior leaders emphasized a shifting of the balance between air defenses and aircraft that was significant but had not been entirely unanticipated. The potency of modern Soviet systems had increased concern by degree rather than by direction, although targeting mobile SAM systems was a particular challenge. In verbal testimony to the House Armed Services Committee in February 1974, Secretary of Defense James R. Schlesinger noted: “We have had an experience in the Middle East that suggests certain potential deficiencies in our forces. For example, the air defense suppression problem is one that comes to

⁸³ Maj R.H. Baxter, Directorate of Operations, Air Staff Talking Paper, subject: Need for Increased Strategic Airlift Capability, 24 November 1974, 1. Document is now declassified.

mind.”⁸⁴ Schlesinger’s written summary in the *Annual Defense Department Report for Financial Year 1975*, released on 4 March 1974, linked this back to American experience in Southeast Asia:

[One] conclusion we have drawn is that the defense suppression capabilities of our tactical air forces must be further improved. We learned that lesson earlier in Vietnam... But the intensity and effectiveness displayed by the ground air defenses in the Middle East conflict impressed upon us even more compellingly the need to take still further actions to enhance the defense- suppression capabilities of our tactical forces.⁸⁵

Dr Malcolm Currie, Director of Defense Research and Engineering, agreed, noting in his testimony to the House Armed Services Committee: “We certainly, in our R.&D. program, anticipated the defense suppression problem.”⁸⁶ However, this had only been true to an extent; the war had pointed to an increased requirement to focus on suppression capabilities and procedures.⁸⁷ Chairman of the Joint Chiefs of Staff Admiral Thomas H. Moorer concluded: “...the ability to locate and destroy mobile SAMs must be modern and sophisticated... The Air Force is applying special management emphasis to the accelerated development and procurement of systems to suppress air defense.”⁸⁸ Suppression of air defenses had been anticipated as an issue to be addressed, based in part on US experiences in Vietnam, but the Yom Kippur War had revealed this problem to be more critical than previously realized.

⁸⁴ Schlesinger to Senate, 5 February 1974, *Hearings before the Committee on Armed Services*, 274.

⁸⁵ Department of Defense, *Report of the Secretary of Defense 1975*, 142-143.

⁸⁶ Currie to Senate, 26 February 1974, *Hearings before the Committee on Armed Services*, 956.

⁸⁷ Currie to Senate, 26 February 1974, *Hearings before the Committee on Armed Services*, 956.

⁸⁸ Moorer to Senate, 5 February 1974, *Hearings before the Committee on Armed Services*, 272.

Senior policy statements highlighted the need to blend technical and conceptual solutions to these lethality challenges. Secretary of the Air Force McLucas highlighted the requirement for “qualitative improvements in existing forces” in his testimony to the House Armed Services Committee, again linking the Yom Kippur War to Vietnam: “Combat experience - noted both in Southeast Asia and the Middle East - has demonstrated the need for continually updating tactical capabilities... and the introduction of new weapon systems [including] improved detection and targeting, electronic warfare [and] precision attack munitions.”⁸⁹ Dr Currie agreed with the need to pursue technological ‘fixes’ to the problems of the modern battlefield: “We are convinced of the revolutionary aspects of applying precision guidance to conventional weapons.”⁹⁰ However, Currie also emphatically highlighted the parallel theme of conceptual developments: “The single most important overall lesson of the war was the reminder that training was crucial.”⁹¹ Currie believed research and development could enhance training opportunities and simplify the operation of weapon systems.⁹² A blend of technological and conceptual offsets to the challenges posed by the modern battlefield was thus emphasized as a developmental focus.

High attrition rates and consumption of materiel and ammunition were more surprising to senior observers, although again the official position emphasized the degree to which the Middle Eastern battlefield had consumed equipment. Dr Currie noted the “war demonstrated that

⁸⁹ McLucas to Senate, 7 February 1974, *Hearings before the Committee on Armed Services*, 318.

⁹⁰ Currie to Senate, 26 February 1974, *Hearings before the Committee on Armed Services*, 809.

⁹¹ Currie to Senate, 26 February 1974, *Hearings before the Committee on Armed Services*, 791.

⁹² Currie to Senate, 26 February 1974, *Hearings before the Committee on Armed Services*, 791.

weapon expenditure rates can be very high in the early phases of a [conflict],”⁹³ while Admiral Moorer concluded:

The enormous expenditure of missiles... and anti-tank munitions, together with the level of equipment attrition, demonstrates once again the necessity of maintaining ample stocks... we must quickly build up our inventory levels for all items of supply and equipment.⁹⁴

Secretary of the Air Force McLucas agreed: “We must begin immediately to build up our munitions, missile, and aircraft inventories to meet war reserve levels demonstrated by the Middle East crisis.”⁹⁵ Moore also noted the restrictions placed upon US readiness that had resulted from providing “moderate quantities” of equipment to Israel, reflecting “the magnitude of worldwide deficiencies in the level of arms, munitions and war material maintained by the United States.”⁹⁶ These senior views reflected military analysis - the US needed to increase equipment quantities in order to sustain its own future war fighting capacity and its ability to resupply allies.

Finally, policy statements emphasized the linked issue of airlift capability. Officials noted that sufficient war stocks must not only be held in reserve - they must be deployable and made available on the battlefield. Secretary McLucas believed both Vietnam and the Yom Kippur War had “emphasized the great importance of maintaining highly capable strategic airlift and aerial refueling forces... the Mid-East crisis

⁹³ Currie to Senate, 26 February 1974, *Hearings before the Committee on Armed Services*, 791.

⁹⁴ Moorer to Senate, 5 February 1974, *Hearings before the Committee on Armed Services*, 272.

⁹⁵ McLucas to Senate, 7 February 1974, *Hearings before the Committee on Armed Services*, 318.

⁹⁶ Moorer to Senate, 5 February 1974, *Hearings before the Committee on Armed Services*, 272.

reemphasized the need to... enhance our strategic airlift capacity.”⁹⁷ Dr Currie also highlighted air mobility as an area of importance: “I think [the war] gave us a renewed feeling of the importance of that.”⁹⁸ Moorer summarized: “The conflict once again demonstrated that an efficient logistic system is the backbone of any sustained combat capability... We must retain the capability to respond rapidly with airlift to move personnel and essential supplies and equipment.”⁹⁹ Noting the impressive performance of the C-5 and C-141 in October 1973, he concluded: “Increased numbers of outsized and oversize aircraft are essential if we are to achieve the airlift capabilities necessary to support our NATO commitment.”¹⁰⁰ Operation Nickel Grass had been a success, but extrapolation of existing capabilities onto a potential NATO scenario suggested that airlift would be a necessary acquisition focus.

Overall, the views of senior policymakers in the aftermath of the war were broadly aligned with those of external observers. The vicarious experience of the war in the Middle East had augmented the direct lessons of Vietnam. The war had suggested that weaknesses first exposed in Southeast Asia were more critical than had been suspected, especially when transposed onto a NATO-Warsaw Pact conflict in Europe. The US military benefitted from unique postwar access to Israeli data and officials, and identified a range of lessons with relevance for force structures, equipment, training and doctrine. These lessons demanded a corresponding range of capability and conceptual changes. The Air Force, and its ‘Vietnam Generation’, moved to implement the necessary

⁹⁷ McLucas to Senate, 7 February 1974, *Hearings before the Committee on Armed Services*, 318.

⁹⁸ Currie to Senate, 26 February 1974, *Hearings before the Committee on Armed Services*, 956.

⁹⁹ Moorer to Senate, 5 February 1974, *Hearings before the Committee on Armed Services*, 272.

¹⁰⁰ Moorer to Senate, 5 February 1974, *Hearings before the Committee on Armed Services*, 272.

wide-ranging improvements, merging US and Israeli experiences to ‘fix’ American air power.



Chapter 3

Equipment, Training and Tactics:

Tracing Developments Through - and To - the Yom Kippur War

The Yom Kippur War contributed to significant developments in Air Force equipment, training and tactics - the *means*, and elements of the *ways*, of air warfare. The conflict was instrumental in the adoption of an “offset strategy” that aimed to provide “qualitative advantages to American forces to offset the quantitative advantage [of] Soviet forces.”¹ Analysis of the war catalyzed ongoing developments in some technical areas while creating renewed or novel emphasis in others. An overview of post-1973 budget initiatives illustrates the broad scope of the war’s influence on Air Force acquisition and development planning. A more focused consideration of two capability areas - suppression of enemy air defenses (SEAD), and stealth - highlights the war’s differing forms of influence. In the case of suppression capabilities, long term development can be traced back *through* the Yom Kippur War. For stealth technology, and specifically the F-117, capability development can be more accurately traced back *to* the conflict. These technological offsets were complemented by parallel conceptual developments in training and tactics. Vietnam-era inadequacies were addressed with added urgency as a result of the Israeli experience in 1973. The war influenced revolutionary training reforms including Exercise Red Flag and the establishment of realistic threat simulations. These training reforms interacted in turn with equipment programs that had been catalyzed by the Yom Kippur War, ensuring that advanced technologies were

¹ Keith L. Shimko, *The Iraq Wars and America's Military Revolution* (New York, NY: Cambridge University Press, 2010), 36; Robert R. Tomes, *U.S. Defense Strategy from Vietnam to Operation Iraqi Freedom: Military Innovation and the New American Way of War, 1973- 2003* (Abington, Oxon: Routledge, 2007), 66.

translated into true operational capabilities. The 1991 Gulf War revealed the maturity of these reforms, and showed how effectively the Air Force translated aspiration into capability after 1973.

Acquisition Programs and Technology

The Yom Kippur War contributed to the adoption of an “offset strategy” by the US military during the 1970s.² This strategy pursued “leap-ahead technologies to offset Soviet superiority in Europe.”³ The Department of Defense Annual Report for FY 1975 declared:

Our tactical air forces not only represent a great investment of national resources, they are also a most essential element in our national defense strategy. We count on them to offset in part possible numerical inferiorities in land forces as compared to potential adversaries.⁴

The breadth of areas addressed within the report revealed the speed and extent to which the Yom Kippur War influenced the development of capabilities with significant, and enduring, relevance for US air power. The official TAC history for 1973/1974 observed: “Procurement authorizations for FY 1975 generally represented a move away from Southeast Asia constraints to an awareness of a rapidly growing Soviet threat highlighted by its Mideast power play.”⁵ In testimony to the Senate Committee on Armed Services, Secretary of Defense Schlesinger explained that the proposed FY 1975 budget

² Tomes, *US Defense Strategy*, 58.

³ Tomes, *US Defense Strategy*, 65.

⁴ Department of Defense, *Report of the Secretary of Defense James R. Schlesinger to the Congress on the FY 1975 Defense Budget and FY 1975-1979 Defense Program, March 4, 1974* (Washington, D.C.: U.S. Government Printing Office, 1974), 112.

⁵ History, Tactical Air Command (TAC), July 1973 to July 1974, Vol 1, 121. Document is now declassified.

reflected “...what we regard as our lessons learned from the recent Middle East conflict.”⁶ The report identified a number of supplemental requests for the existing 1974 budget:

The Supplemental request... reflects the most urgent deficiencies in the condition of our forces that were made apparent by the Middle East hostilities. With these deficiencies in mind, I have included \$1,397 million to improve the readiness of our forces, \$169 million to increase our airlift capability, and \$516 million to buy certain high-value weapons and equipment which are now in short supply in our Services.⁷

These supplemental requests included a number of items with specific relevance for the Air Force, such as new air munitions, improvements to “a number of USAF aircraft”, and increased research and development funding.⁸ These represented the outcome of programmatic reviews directed by Air Force Chief of Staff General George S. Brown, who had asked his staff for “a priority listing of projects which would help penetrate SAM defenses, defeat armor, and permit close air support in a dense SAM environment.”⁹ These short-term fixes were then extended into the full budget proposal for 1975, which reinforced or initiated key acquisition programs.

The broad scope of these programs indicated the extent of the Yom Kippur War’s influence. The FY 1975 budget emphasized tactical aircraft that were already in development, notably the F-15 and A-10, preempting TAC’s later conclusion that the war had supported the requirements for

⁶ Schlesinger to Senate, 5 February 1974, *Fiscal Year 1975 Authorization for Military Procurement, Research and Development, and Active Duty, Selected Reserve, and Civilian Personnel Strengths: Hearings before the Committee on Armed Services, United States Senate*. 93rd Cong., 2nd sess., 1974, 6.

⁷ Department of Defense, *Report of the Secretary of Defense 1975*, 17.

⁸ Department of Defense, *Report of the Secretary of Defense 1975*, 18.

⁹ TAC History, 121.

these modern platforms.¹⁰ This in turn corroborated Operations Directorate summaries that related the appropriateness of existing Air Force programs to the lessons identified from October 1973.¹¹ The A-10 in particular offered characteristics that promised to address some of the requirements identified after the war - rugged survivability, maneuverability, and the ability to destroy enemy armor in the close air support mission - as the Air Force contemplated an enforced "flyoff" with the older A-7.¹² The F-15 and the A-10 predated the Yom Kippur War, but the suitability of these programs against future requirements was reinforced by Israeli experience.

New tactical aircraft would require enhanced command and control capabilities. The budget report stated: "Defense planners have been convinced for some time that future demands on our surveillance, warning and control capabilities in support of tactical air operations, particularly in the context of a European conflict, will be quite severe. This conviction was reinforced by the complexities of the surveillance, warning and control function in both the Southeast Asia and the Middle East conflicts."¹³ As a result, the E-3 AWACS program was scheduled to transition from development to procurement in FY 1975, with \$770 million allocated for the purchase of the first 12 airframes.¹⁴ As with the F-15 and the A-10, the relevance of the AWACS program was confirmed by the perceived lessons of the Yom Kippur War.

The high attrition rates observed in October 1973 reinforced the need to focus on both weapon system quality and quantity. In terms of qualitative developments, the Air Force drew a number of precision

¹⁰ Department of Defense, *Report of the Secretary of Defense 1975*, 150-152; TAC History, 190.

¹¹ Lt Col C.A. Horner, Directorate of Operations, Air Staff Talking Paper, subject: Mid East War Data Support of USAF Programs, 24 November 1973. Document is now declassified.

¹² TAC History, 152, 157.

¹³ Department of Defense, *Report of the Secretary of Defense 1975*, 152.

¹⁴ Department of Defense, *Report of the Secretary of Defense 1975*, 146.

capabilities together within the Pave Strike program. This included enhancements to weapon guidance capabilities including a laser-guided variant of the Maverick; suppression capabilities including the EF-111 aircraft; and other improvements to precision and stand-off attack capabilities.¹⁵ The Yom Kippur War catalyzed this collection of programs, and emphasis would now be “given to an expeditious development leading to an early [Initial Operating Capability].”¹⁶ Regarding issues of platform and weapons *quantity*, the 1975 budget report noted a damaging trend for increasing complexity and cost that resulted in decreased overall numbers:

...quantity as well as sophistication is essential if our general purpose air forces are to be able to perform successfully their assigned missions. No matter how effective a particular tactical aircraft may be, a certain minimum number is needed to cover a battlefield, a front or a combat theater... we stand in danger of falling below that minimum quantitative level if present trends are allowed to continue unabated.¹⁷

This observation supported the existing concept of a “high/low” force mix and validated the emerging Lightweight Fighter program that resulted in the F-16.¹⁸ It also drove decisions to procure greater numbers of munitions; as an example, \$88 million allocated to the purchase of an additional 6,000 Maverick missiles in FY 1975.¹⁹

The budget report also identified air transport as a key investment area, drawing on the direct American experience of Operation Nickel

¹⁵ Currie to Senate, 26 February 1974, *Hearings before the Committee on Armed Services*, 810.

¹⁶ Currie to Senate, 26 February 1974, *Hearings before the Committee on Armed Services*, 810.

¹⁷ Department of Defense, *Report of the Secretary of Defense 1975*, 142-143.

¹⁸ Department of Defense, *Report of the Secretary of Defense 1975*, 145, 151.

¹⁹ Department of Defense, *Report of the Secretary of Defense 1975*, 152.

Grass. Schlesinger observed that a “fundamental examination of our airlift capabilities... is necessary.”²⁰ Further:

The crucial importance of immediately available strategic airlift forces of substantial capacity was once again convincingly demonstrated during the recent Middle East conflict... a major expansion of our strategic airlift capacity deserves a very high priority in the allocation of resources among our general purpose forces programs.²¹

The proposed budget therefore allocated funding to a variety of airlift programs, including airframe modifications, additional C-130 purchase, and - in a direct correlation of Operations Directorate analysis - an extension of air refueling capabilities across air transport fleets to minimize dependence on intermediate air basing.²² These acquisition initiatives supporting the airlift mission again indicated how the Yom Kippur War validated or inspired a range of programs that shaped future Air Force capabilities.

Finally, aircraft survivability and defense suppression received “special” attention in the FY 1975 budget report, which emphasized measures including improved “radar warning equipment, tactical electronic warfare support forces, and a greater number and variety of improved defense-suppression weapons and devices.”²³ The report made a supplemental request for the immediate provision of \$31 million to procure an Advanced Location Strike System (ALSS) that would detect threat emissions and enable guided weapon employment against SAM radar sites.²⁴ The report also requested additional chaff dispensers and radar warning receivers, to be retrofitted to existing aircraft including the

²⁰ Department of Defense, *Report of the Secretary of Defense 1975*, 18.

²¹ Department of Defense, *Report of the Secretary of Defense 1975*, 157, 158.

²² Department of Defense, *Report of the Secretary of Defense 1975*, 159-161.

²³ Department of Defense, *Report of the Secretary of Defense 1975*, 112-113.

²⁴ Department of Defense, *Report of the Secretary of Defense 1975*, 154.

F-4 and F-111.²⁵ The report identified supplemental funding for 800 additional Shrike missiles, plus \$4 million for development of the next-generation High Speed Anti-Radiation Missile (HARM).²⁶ The largest supplemental request was \$75 million for “new [jamming] pods and modification of existing pods to improve the capability of our tactical aircraft to cope with the Soviet tactical air defense threat.”²⁷ The full FY 1975 budget developed these defensive programs, allocating an additional \$18 million to HARM and \$25 million to the development of a Precision Emitter Location and Strike System that would enhance or replace ALSS.²⁸ These budget requests clearly showed that the Yom Kippur War had created a sense of urgency in improving countermeasure and suppression capabilities.

This sense of urgency was undermined to some extent by economic factors. The geopolitical impact of the Yom Kippur War acted as a paradoxical braking influence on the wide-ranging capability changes it inspired. The oil shock of late 1973 and its economic legacy applied pressure to defense spending throughout the remainder of the decade. The FY 1975 budget report already recorded an increase in fuel prices of 123 percent - amounting to an additional \$1.7 billion of forecast expenditure - in response to the ‘oil shock’ that followed October 1973.²⁹ The Air Force would endure a period of ‘hollowing’ before many technical programs entered service.³⁰ However, the platforms and weapons that were inspired or catalyzed by the Yom Kippur War *did* mature, and interacted in turn with parallel training reforms that turned technological solutions into true capabilities.

²⁵ Department of Defense, *Report of the Secretary of Defense 1975*, 154-155.

²⁶ Department of Defense, *Report of the Secretary of Defense 1975*, 155.

²⁷ Department of Defense, *Report of the Secretary of Defense 1975*, 54.

²⁸ Department of Defense, *Report of the Secretary of Defense 1975*, 155.

²⁹ Department of Defense, *Report of the Secretary of Defense 1975*, 19.

³⁰ Stephen P. Randolph, *Powerful and Brutal Weapons: Nixon, Kissinger, and the Easter Offensive* (Cambridge, MA: Harvard University Press, 2007), 117.

The Yom Kippur War and SEAD

An expanded analysis of the Yom Kippur War's impact on SEAD capabilities provides an example of the conflict's influence upon longer term developmental trends. The evolution of the defense suppression mission can be traced back *through* the Yom Kippur War. The influence of the war in this area was catalytic, rather than initiating. US Air Force analysis of Israeli experiences added impetus to earlier developments and accelerated the maturation of linked capabilities and concepts.

The suppression of enemy air defenses existed as an air power concept, but was not tightly defined, prior to the Yom Kippur War. The US Air Force had attacked anti-aircraft artillery sites during the Second World War and in Korea, and the 'birth' of SAM-focused suppression occurred during Vietnam.³¹ The introduction of the SA-2 into North Vietnam led to the creation of an Air Force working group in August 1965 that focused specifically on the theater SAM threat.³² Over three weeks, the task force considered hundreds of proposals from military, industry and scientific sources, and produced four key recommendations: The modification of a small number of fighter aircraft with electronic locating systems that would enable them to find active SAM sites for attack by other aircraft; the development of an anti-radiation missile; the development of self-protection jamming equipment that could be carried on fighter aircraft; and the procurement of radar

³¹ Maj William A. Hewitt, "Planting the Seeds of SEAD: The Wild Weasel in Vietnam," thesis, School of Advanced Airpower Studies, 2010, 4-11.

³² Maj John J. Deeney, "Finding, Fixing, and Finishing the Guideline: The Development of the United States Air Force Surface-to-Air Missile Suppression Force During Operation Rolling Thunder," thesis, U.S. Army Command and General Staff College, 2010, 41.

homing and warning (RHAW) receivers for installation into fighter aircraft operating in theater.³³

The speed of reactive innovation was impressive. The Air Force rapidly created a 'Wild Weasel' program with modified F-100 aircraft and achieved a first confirmed SA-2 kill on 22 December 1965.³⁴ By the end of the Rolling Thunder campaign in 1968, the Air Force had invested in all of the 1965 working group's recommendations and employed early generation RHAW equipment, emitter location systems, self-protection jammers and anti-radiation missiles. By the end of the war, North Vietnamese SA-2 effectiveness had been degraded, requiring 100 missile firings to destroy one US aircraft against an early war rate of only 20 firings per kill.³⁵ The 'building blocks' of later SEAD were thus already established prior to October 1973 - indeed, American ECM equipment and Shrike missiles were supplied to Israeli forces during the Yom Kippur War.

However, the Air Force never attempted a dedicated suppression *campaign* in Vietnam, and SEAD as a formalized concept - with an emphasis on coordinated degradation of an enemy defensive *system* rather than discrete attacks on individual air defense sites - matured only after the Yom Kippur War.³⁶ In a study of SEAD developments completed at the Airpower Research Institute, US Air Force Lt Col James R. Brungess summarized that, over time, "...SEAD grew from necessary informal structure to institutional status."³⁷ In Brungess's view, suppression activities in Vietnam had been "piecemeal" throughout, with "defenses around the immediate target area... attacked *as a function of*

³³ Deeney, "Guideline."

³⁴ Deeney, "Guideline," 51.

³⁵ Deeney, "Guideline," 83-84.

³⁶ James R. Brungess, *Setting the Context Suppression of Enemy Air Defenses and Joint War Fighting in an Uncertain World* (Maxwell Air Force Base, AL.: Air University Press, 1994), 12.

³⁷ Brungess, *Setting the Context*, 2.

the target, not as an element of the enemy's overall air defense structure" (emphasis in original.)³⁸ As a result, while US aircraft were increasingly able to suppress or destroy individual missile sites, other aspects of the air defense network - notably ground control radars and communications - were ignored. The US Air Force finally launched an "all out attack on the North Vietnamese air defenses" only in response to B-52 losses during Linebacker II.³⁹ This belated awareness of the need to attack enemy air defenses as a coherent system, rather than as individual weapons, was quickly reinforced by the spectacle of heavy Israeli losses to integrated Egyptian and Syrian systems in October 1973. Building upon existing but immature concepts of defense suppression, the lessons of the Yom Kippur War produced a significant 'uptick' in the developmental vector of SEAD capabilities for the US Air Force.

Chairman of the Joint Chiefs of Staff Admiral Moorer summarized the heightened relevance of SEAD after the Yom Kippur War in February 1974:

...the classic doctrine that the priority of employment of air assets must be given to gaining and maintaining air superiority over the battlefield had been proven once again. Today, gaining air superiority includes defeating enemy SAMs in detail... The surface-to-air arsenal provided to the Arabs included... missile systems... guns... fire control radar...plus smaller crew-served weapons... Supporting these weapons systems was a surveillance radar system providing complete overlapping coverage at altitudes... In order to achieve air superiority in the face of such defenses, it is necessary to avoid, suppress, or destroy such systems. ECM and the ability to locate and destroy mobile SAMs must be modern and sophisticated. Standoff weapons can play a major role in this effort.⁴⁰

³⁸ Brungess, *Setting the Context*, 4.

³⁹ Brungess, *Setting the Context*, 9.

⁴⁰ Moorer to Senate, 5 February 1974, *Hearings before the Committee on Armed Services*, 271-272.

Moorer's narrative captured many of the elements of modern SEAD: the requirement to obtain control of the air as a prerequisite for other air and ground operations; recognition that adversary systems were integrated and overlapping, representing an Integrated Air Defense System, or IADS, in modern terms; and the need to employ a mix of electronic and kinetic means to locate, avoid, suppress or destroy enemy systems. Moorer's use of the phrase "defeating enemy SAMs in detail" was instructive, suggesting later concepts of 'rolling back' enemy defenses and revealing an appreciation that the threat had crossed a lethality threshold beyond that experienced in Vietnam. Moorer's summary revealed the extent to which defense suppression grabbed the Air Force's attention in the immediate aftermath of the Yom Kippur War, adding urgency to concepts that had been first understood in Vietnam.

Increased organizational emphasis was evident in the prevalence of SEAD-related terminology in official reports after 1973. The 1975 budget report contained 13 references to "suppression." There were 15 references to "suppression" in the subsequent 1976-77 budget report and, extending the sample into the next decade, nine uses of the term in the 1983 report. In comparison, there had been no uses of the term in the equivalent FY 1974 report; only a single use in the 1973 summary; and no references in 1971. These earlier reports had discussed Soviet air defenses only briefly, focusing on low-level strategic bomber ingress and making only incidental references to suppression technologies such as air-to-surface missiles and electronic warfare. Even though suppression activities had been undertaken in Vietnam, the SEAD mission was evidently seen as secondary prior to the Yom Kippur War and had not attracted headline status in high-level Defense Department expenditure debates. Changes in prevailing terminology have proven enduring. Current Air Force strategy declares, in language that might come directly from the 1975 budget summary: "We cannot allow the ever-increasing potential of enemy air defenses to diminish our offensive capabilities.

Our penetrating weapon systems must have high probability of success.”⁴¹ The war made suppression of enemy defenses an established part of the defense task, and an emphasized component of budget allocation processes.

The ‘uptick’ engendered in the developmental vector of Air Force SEAD capabilities was further accelerated by another Israeli experience - this time successful - against Syrian defenses in the Lebanese Bekaa Valley in 1982. A dedicated Israeli SEAD force, employing electronic and physical attack and supported by long-range ground fires, rendered the Syrian air defense system impotent before a following wave of strike aircraft destroyed the paralyzed SAM batteries without loss.⁴² The Israelis had coordinated fighters, command and control aircraft, electronic warfare platforms, strike aircraft, UAVs, and ground support. The Israeli commander, General David Ivri, described the operation, *Arzav*, as “a concert, rather than dozens of solos.”⁴³ The US Air Force once again sent a fact-finding mission to Israel to capture relevant lessons.⁴⁴ Assessing the development of American air power between Vietnam and Desert Storm, Benjamin Lambeth asserted “the results of the Bekaa Valley shootout offered grounds for guarded Air Force... assurance that their investments... over the previous decade had been vindicated.”⁴⁵ If Vietnam had birthed the tactical SAM threat, and the Yom Kippur War revealed that Soviet-made defenses had come of age, then the 1982 Bekaa Valley battle showed that the necessary countering

⁴¹ United States Air Force, *America’s Air Force: A Call to the Future*, July 2014, 16.

⁴² Shmuel Gordon, “Air Superiority in the Israel-Arab Wars,” in *A History of Air Warfare*, ed. John Andreas Olsen (Washington, D.C.: Potomac Books, 2010), 151.

⁴³ Gordon, “Air Superiority in the Israel-Arab Wars,” 151.

⁴⁴ Benjamin S. Lambeth, *The Transformation of American Air Power* (Ithaca, NY: Cornell University Press, 2000), 41.

⁴⁵ Lambeth, *Transformation of American Air Power*, 96.

capabilities had also reached maturity. For the US Air Force, the developmental vector was firmly set.

The Air Force built a SEAD force around a triad of electronic combat and defense suppression platforms - the F-4G, EF-111, and EC-130H - and by the late 1980s had made the “transition from single-system to holistic analysis of the SEAD threat”, viewing the SEAD task with reference to an integrated enemy system rather than maintaining the Vietnam-era “function of the target” approach.⁴⁶ SEAD was established as a specific Air Force focus; the 1984 version of Air Force aerospace doctrine, *Air Force Manual 1-1*, identified SEAD as a subset of the Offensive Counter Air mission, defined as: “Aerospace operations which neutralize, destroy or temporarily degrade enemy air defense systems in a specific area by physical and/or electronic attack.”⁴⁷ A 1985 publication, *The Tactical Air Force Guide for Integrated Electronic Combat*, identified SEAD as an integrating concept that would meld weapons systems from across the Air Force and the other services.⁴⁸ The Air Force-Navy attack against Libya in April 1986 showed that suppression capabilities were developing, but true maturity was revealed in January 1991.⁴⁹ Operation Desert Storm opened with a comprehensive SEAD campaign, with specialized suppression aircraft supported by non-specialist aircraft attacking air defense-related targets. The US Army supported the Air Force with attack helicopter and surface-to-surface missile strikes.⁵⁰ US Navy Tomahawks and aircraft, Marine Corps aviation, and Coalition aircraft rounded out a sustained SEAD campaign. US suppression capabilities, initiated in Vietnam and then

⁴⁶ Brungess, *Setting the Context*, 104, 98.

⁴⁷ Air Force Manual (AFM) 1-1, *Basic Aerospace Doctrine of the United States Air Force*, 16 March 1984, 3-3.

⁴⁸ AFM 1-1 (1984), 3-6, 3-7; Brungess, *Setting the Context*, 104.

⁴⁹ Brungess, *Setting the Context*, 26.

⁵⁰ Maj Stanley J. Dougherty, “Defense Suppression: Building Some Operational Concepts,” thesis, School of Advanced Airpower Studies, 1992, 17-18.

accelerated by Israeli experiences, had come of age. The form and scale of the integrated suppression campaign during Operation Desert Storm went far beyond earlier American air operations, even if the principles themselves were not truly new.⁵¹

The Yom Kippur War was thus a significant milestone in the development of Air Force SEAD capabilities over time. Vietnam, the Yom Kippur War in 1973, the Bekaa Valley in 1982, and Desert Storm in 1991 represented striking 'wayposts' in the development of SEAD in the surface-to-air missile age. Direct US experiences at either end of this developmental process were augmented by the vicarious experiences of the Israeli Air Force. This was indicative of a broader trend of American-Israeli parallelism, and this theme is explored in the concluding chapter of this study; specifically in terms of SEAD capabilities, however, the Yom Kippur War was a very significant event *through* which the development of American SEAD capabilities can be traced.

The Origins of the F-117

The closely linked issue of platform survivability also received prominent attention after the Yom Kippur War. As with SEAD, capabilities such as radar warning receivers and chaff predated the conflict, with some again extending as far back as the Second World War. In many cases these capabilities can therefore again be traced back *through* the Yom Kippur War. However, in one notable case - stealth technology - developments prior to 1973 had been extremely limited, and it was the lethality observed over the Sinai and the Golan that specifically animated the development of the first US stealth aircraft. The F-117

⁵¹ Thomas A. Keaney and Eliot A. Cohen, *Revolution in Warfare? Air Power in the Persian Gulf* (Annapolis, MD: Naval Institute Press, 1995), 202.

therefore represents an example of a capability that can be justifiably traced back to the Yom Kippur War for an explanation of its genesis.

The concept of reducing an aircraft's radar cross section (RCS) predated the 1973 conflict - Germany had experimented with stealth during the Second World War - but attempts to create low observable platforms had achieved very limited success.⁵² The SR-71 was the sole US military example of a manned aircraft that employed some stealthy characteristics, but these were compromised by the aerodynamic requirements of high altitude, high speed flight.⁵³ American experience in Vietnam had resulted in a 1971 Air Force recommendation to develop a very low RCS test vehicle.⁵⁴ However, this project was not pursued, with funding prioritized for alternative non-stealth projects.⁵⁵

Low RCS projects only gained traction after the Yom Kippur War, when survivability became a critical focus. The Department of Defense and its research organizations directed a number of workshops and studies in response to the challenges perceived in October 1973. A Scientific Advisory Board met with TAC personnel at Langley AFB in November 1973 to discuss aircraft survivability issues.⁵⁶ A later Defense Science Board study, completed during the summer of 1974, extrapolated the results of the Arab-Israeli conflict onto a European scenario, and concluded that US and NATO air forces would be decimated in a general war in as little as two weeks.⁵⁷ Following this

⁵² Brian D. Laslie, *The Air Force Way of War: U.S. Tactics and Training After Vietnam* (Lexington, KY: University Press of Kentucky, 2015), 92; David C. Aronstein and Albert C. Piccirillo, *Have Blue and the F-117A: Evolution of the "Stealth Fighter"* (Reston, VA: American Institute of Aeronautics and Astronautics, 1997), 195-196.

⁵³ Aronstein and Piccirillo, *Have Blue*, 199-200.

⁵⁴ Aronstein and Piccirillo, *Have Blue*, 11.

⁵⁵ Aronstein and Piccirillo, *Have Blue*, 11.

⁵⁶ TAC History, 125.

⁵⁷ Aronstein and Piccirillo, *Have Blue*, 12, 14; Paul G. Kaminski, "Low Observables: The Air Force and Stealth," in *Technology and the Air Force: A Retrospective Assessment*, eds. Jacob Neufeld, George M. Watson, Jr., and

study, Director of Defense Research and Engineering Dr. Malcolm Currie instructed the pursuit of “radical new ideas” that might overcome the air defense problem.⁵⁸ DARPA, sponsored by the Air Force, proposed a “high stealth aircraft” that, for many observers, represented “a silver bullet... that could blow a hole through [Soviet] defenses.”⁵⁹

The key novelty was a focus on radar signature reduction as a passive defense, quite different from prevailing opinions that RCS reduction could only ever be partially effective and would be necessarily complemented by electronic countermeasures.⁶⁰ DARPA requested low RCS feasibility studies from five aerospace companies - Northrop, McDonnell Douglas, General Dynamics, Fairchild and Grumman.⁶¹ Ultimately, however, it was Lockheed - with experience in ‘Skunkworks’ programs including the A-12 precursor to the SR-71 - that developed a concept air platform, ‘Have Blue’, and then the F-117 itself, which was allocated the codename ‘Senior Trend.’⁶² The F-117 achieved Initial Operating Capability in 1983 before achieving its first operational employment during Operation Just Cause in Panama in 1989. Most famously, the F-117 penetrated heavy defenses, without loss, to attack targets in Baghdad in January 1991.⁶³ Stealth gave the aircraft “built in” air superiority, and a threat environment of the type perceived in October 1973 was thus tamed by an aircraft that had been developed as a *direct* outcome of American analysis of the Arab-Israeli war.⁶⁴ Stealth

David Chenoweth, (Washington D.C.: Air Force History and Museums Program, 1997), 299-300.

⁵⁸ Ian A. Maddock, “DARPA’s Stealth Revolution,” in *50 Years of Bridging the Gap*, DARPA, 2012, 152.

⁵⁹ Maddock, “Stealth Revolution,” 152; Kaminski, “Low Observables,” 300.

⁶⁰ Robert H. Van Atta et al, *Transformation and Transition: DARPA’s Role in Fostering an Emerging Revolution in Military Affairs, Volume 2 – Detailed Assessments*, Institute for Defense Analyses Paper P-3698 (Institute for Defense Analyses: Alexandria, VA, November 2003), I-1, I-2.

⁶¹ Tomes, *US Defense Strategy*, 79.

⁶² Aronstein and Piccirillo, *Have Blue*, 32-33.

⁶³ Aronstein and Piccirillo, *Have Blue*, 3, 154.

⁶⁴ Keaney and Cohen, *Revolution in Warfare*, 208.

technology has since broadened in its application, and the low-RCS F-22 and F-35 perhaps most clearly fulfill the intention to develop tactical aircraft that could survive where Israeli Phantoms and Skyhawks had perished. The tangible genesis of this family of capabilities, originating with the F-117, can be traced back to requirements that emerged from the Yom Kippur War.

Training Reforms and Tactical Development

Improvements in technical capabilities were matched by parallel improvements in training. This process of reform was a key *conceptual* offset that enabled the exploitation of new technology that “in and of itself, could not guarantee air combat success.”⁶⁵ US Air Force training had been identified as inadequate during the Vietnam War. This observation was reinforced by Israeli experience during October 1973 that showed the value of effective pre-conflict training. By reconfiguring training programs to incorporate modern threats and complex tactical challenges, the US Air Force blended the lessons of Vietnam and the Yom Kippur War, and honed the fighting instrument that proved itself in combat in the Persian Gulf in January 1991.

The US Air Force had observed the inadequacies of its training programs and processes during the Vietnam War. Aircrew deploying to Southeast Asia completed training programs that delivered “a poor learning experience that did not adequately prepare them for the rigors of war.”⁶⁶ Partly due to the dominance of SAC and the strategic/nuclear

⁶⁵ Lambeth, *Transformation of American Air Power*, 59.

⁶⁶ C. R. Anderegg, *Sierra Hotel: Flying Air Force Fighters in the Decade After Vietnam* (Washington D.C.: Government Reprints Press, 2001), 17.

mission prior to Vietnam, “training programs for fighter pilots did not emphasize maneuvering to avoid surface-to-air missiles or how to properly dogfight against enemy aircraft.”⁶⁷ Air Force training did not expose pilots to dissimilar opponents, preferring instead simple scenarios in which one aircraft conducted basic maneuvering against another of the same type.⁶⁸ Moreover, the universally assignable pilot program, in which tanker and airlift pilots were transferred to fighter duties via short and simplistic courses at replacement training units, diluted the quality of combat aircrews.⁶⁹ The disconnect between training and combat operations was exemplified by the fact that F-105 pilots deploying to Vietnam had to prove themselves combat ready by demonstrating proficiency in irrelevant nuclear weapon delivery profiles.⁷⁰

The result was a tactical force of mixed ability pilots who had received too little training, especially in the high-end scenarios they would experience in combat.⁷¹ Newly deployed aircrews therefore survived or perished based on their ability to adapt and improvise during their first operational sorties.⁷² The Air Force recognized these problems and conducted detailed studies, such as the Red Baron series of air-to-air engagement analyses, but change occurred slowly.⁷³ Senior officers resisted the idea that training was inadequate, emphasizing low relative loss rates compared to earlier conflicts and downplaying air-to-air exchange ratios, despite the growing disquiet of pilots such as Chuck Horner who returned from Vietnam to fill training and then staff

⁶⁷ Laslie, *Air Force After Vietnam*, 5.

⁶⁸ Marshall L. Michel, *Clashes: Air Combat over North Vietnam, 1965-1972* (Annapolis, MD: Naval Institute Press, 1997), 289; Laslie, *Air Force After Vietnam*, 8.

⁶⁹ Laslie, *Air Force After Vietnam*, 10-11.

⁷⁰ James Kitfield, *Prodigal Soldiers; How the Generation of Officers Born of Vietnam Revolutionized the American Style of War* (Washington D.C.: Potomac Books, 1997), 76.

⁷¹ Laslie, *Air Force After Vietnam*, 11.

⁷² Kitfield, *Prodigal Soldiers*, 76.

⁷³ Laslie, *Air Force After Vietnam*, 20-23.

appointments.⁷⁴ While the US Navy established its 'Top Gun' Fighter Weapons School in 1969, the US Air Force only started to seriously prepare revisions to its tactical training processes after a Fighter Weapons Symposium convened at Nellis AFB in 1972, and fundamental changes had not been implemented by the war's end.⁷⁵ The first Aggressor squadron, flying agile F-5 aircraft to simulate Soviet MiGs, was not operational until June 1973.⁷⁶ Exercise Red Flag, in many respects the heart of revised training as it developed after Vietnam, was first completed in November 1975.⁷⁷ Air Force training was patently not fit for purpose during the Vietnam War, and improvements were nascent at best by the time US combat forces were withdrawn from Southeast Asia in 1973.

The Yom Kippur War therefore occurred during a period of imminent, but as-yet unrealized, change. Would-be reformers had "lots of velocity, but no vector" after Vietnam; Israeli experience provided the missing vector, and injected vicarious support into proposed training reforms.⁷⁸ For example, the TAC history for 1973-1974 noted that the expansion of dissimilar air combat training and the Aggressor squadron concept was "reinforced by lessons learned in SEA [Southeast Asia] and in the Middle-East conflict."⁷⁹ Moreover, the nature of the Yom Kippur War, in which Israeli losses had been primarily caused by ground-based threats rather than enemy fighters, and air support to ground forces had been critical, extended the focus of reformers from air-to-air combat to complex threat evasion and targeting challenges. General Dixon, who oversaw the creation of Exercise Red Flag, noted after the visit of Israeli

⁷⁴ Laslie, *Air Force After Vietnam*, 28, 32; Horner's training experience in Kitfield, *Prodigal Soldiers*, 76.

⁷⁵ Michel, *Clashes*, 289; Lambeth, *Transformation of American Air Power*, 61, 65.

⁷⁶ Lambeth, *Transformation of American Air Power*, 60.

⁷⁷ Marshall L. Michel, "The Revolt of the Majors: How the Air Force Changed After Vietnam," PhD diss., Auburn University, 2006, 217.

⁷⁸ Michel, "Revolt of the Majors," 189; Laslie, *Air Force After Vietnam*, 37.

⁷⁹ TAC History, 115.

General Peled in March 1974: “Our air-to-air training needs to be made more realistic and *more so* our air-to-ground training.”⁸⁰ In the same month, TAC directed the Tactical Fighter Weapons Center to prepare realistic continuation training packages, ‘based on Israeli experience in the October War, to introduce realism into air-to-ground training.’⁸¹ Dixon later stated the Yom Kippur War had been a key influence on his reshaping of TAC’s training programs.⁸²

The officer considered to be the ‘father’ of Red Flag at the tactical level, Major Richard “Moody” Suter, transferred from the Fighter Weapons School at Nellis to the Operations Directorate in the Pentagon just after the Yom Kippur War.⁸³ Suter, who had already begun to design a centerpiece exercise for Air Force tactical training, was further energized in a working environment dominated by the implications of the Arab-Israeli conflict.⁸⁴ His discussions as part of a cohort nicknamed the “Iron Majors” - also including John Corder, who had helped to form the Aggressor program, and Chuck Horner, who composed several of the talking papers that the Pentagon produced in response to the Yom Kippur War - matured the Red Flag concept that Suter would later propose to General Dixon.⁸⁵ The Air Force’s ‘Vietnam Generation’ did not, therefore, base their training reforms purely on the Vietnam experience. In a process that paralleled the dynamics of acquisition change, the Yom Kippur War reinforced training reforms that had conceptual origins prior to 1973.

The Israeli experience also contributed to American training reform through direct bilateral interactions. Israeli Air Force personnel

⁸⁰ Gen Robert J. Dixon, Commander, Tactical Air Command, to Gen George S Brown, Chief of Staff, United States Air Force, letter, 12 March 1974, 4. Document is now declassified.

⁸¹ TAC History, 111.

⁸² Michel, “Revolt of the Majors,” 186.

⁸³ Laslie, *Air Force After Vietnam*, 56.

⁸⁴ Michel, “Revolt of the Majors,” 202.

⁸⁵ Michel, “Revolt of the Majors,” 202-203.

undertook a training-focused visit to the US in May 1974 with the intention of critiquing TAC's F-4 training programs.⁸⁶ The official TAC history of the visit noted the Israeli Air Force "trained realistically using combat tactics and navigational problems, and low-level target bombardment."⁸⁷ TAC, by inference, did none of this, and noted the need to "improve performance in this area."⁸⁸ The resulting Israeli visit report was scathing, and especially critical of an American focus on flight safety that compromised operational competence.⁸⁹ By providing an external view of US training, the visiting Israelis used their own training and combat experience to provide a hard, albeit positively intentioned, critique of American practices.

In addition, the Israelis provided access to information and materiel that helped the US Air Force to more accurately train against enemy threat systems. Various reports indicated the Israelis transferred captured Soviet equipment to the US, and the Air Force subsequently incorporated this materiel into its training reforms. The Israelis had already transferred Arab MiG-17 and MiG-21 aircraft to the US in the 1960s, subsequently flown by American pilots under the codenames Have Drill and Have Donut.⁹⁰ US aircrews trained in simulated combat against these aircraft under the Constant Peg program through the 1970s and 1980s.⁹¹ Following the Yom Kippur War, the Israelis provided the US Air Force with further access to captured Soviet radar and missile equipment, including components of the SA-6 system, providing a "huge windfall" for TAC as it revised its training processes.⁹² The transfer was overseen by John Corder in his role within the Operations Directorate,

⁸⁶ TAC History, 110.

⁸⁷ TAC History, 111.

⁸⁸ TAC History, 111.

⁸⁹ Michel, "Revolt of the Majors," 196-197.

⁹⁰ Michel, "Revolt of the Majors," 109.

⁹¹ Laslie, *Air Force After Vietnam*, 51.

⁹² Michel, "Revolt of the Majors," 185-186.

further cementing the influence of the Yom Kippur War on the field grade officers who were pushing for training innovation from the tactical level.⁹³ This Soviet/Arab equipment was used in several ways. The Air Force created a 'hands on' Threat Training Facility - later known as the 'Petting Zoo' - at Nellis AFB in which US personnel could increase their familiarity with the appearance and characteristics of these enemy systems.⁹⁴ In terms of tactical training, possession of this equipment allowed the use of real Soviet radars, or the derivation of emulation systems, to provide aircrew with realistic threats during training missions.⁹⁵ Later developments of the training program at Nellis resulted in Exercise Green Flag, an electronic warfare and suppression variation of the original Red Flag program, that maximized the use of electronic range assets.⁹⁶ Access to captured Soviet equipment after October 1973 contributed greatly to the realism and, therefore, the *value* of the exercises conducted at Nellis, improving the complexity of TAC's advanced training programs and better preparing US aircrews for combat.

These enhanced training programs allowed the development of tactics that were in turn analyzed and revised by aircrews and leaders as their competence increased. As an example, the attrition experienced during the first days of the Yom Kippur War had led the Israelis to adopt low level tactics in order to defeat radar SAM systems with terrain masking and by minimizing tracking times.⁹⁷ The results were ambiguous; losses to radar-guided SAMs reduced, but the threat from AAA and man-portable missiles such as the SA-7 increased at low level. The Israelis, however, emphasized this 'go low' approach as a tactical solution to the air defense problem, and the US Air Force followed the

⁹³ Andereg, *Sierra Hotel*, 96.

⁹⁴ Andereg, *Sierra Hotel*, 96; Laslie, *Air Force After Vietnam*, 60-61.

⁹⁵ Andereg, *Sierra Hotel*, 94; Michel, "Revolt of the Majors," 203, 213.

⁹⁶ Lambeth, *Transformation of American Air Power*, 63.

⁹⁷ Lambeth, *Transformation of American Air Power*, 68-70.

Israeli lead.⁹⁸ Heeding Israeli criticism that TAC was excessively risk averse, and content that the 'go low' approach was an appropriate counter to the SAM threat, General Dixon introduced low-altitude tactics into Exercise Red Flag despite the increased risk of accidents in complex training scenarios.⁹⁹ As a result, the US Air Force proceeded to train pilots to fly and fight at altitudes as low as 100 feet.¹⁰⁰ Training losses were, however, indeed high; during the first four years of Red Flag, 24 aircraft were lost on the Nellis ranges, many due to collision with the ground, and this represented more than three times the loss rate that TAC suffered in general training flights.¹⁰¹

By the mid-1980s, the 'go low' mindset had been changed due to a changed appreciation of the ground defense problem and the maturing of alternative, technology-based solutions. General Wilbur 'Bill' Creech, commander of TAC from 1978, observed that avoiding, rather than destroying, SAMs meant that pilots would, in combat, face the same threats and risks during each mission in an extended campaign.¹⁰² Moreover, 'ducking under' radar SAMs exposed crews to the AAA and man-portable threats that had inflicted so many losses on the Israelis in 1973. High rates of simulated attrition on the Nellis range supported these conclusions: Red Flag pilots complained that the primary lesson they were learning was that combat was not survivable. For Creech, the tactical approach was simply wrong:

We were using tactics that weren't going to work... We're now going to make defense roll back... our first order of business... We need to get up out of the weeds as soon as

⁹⁸ International Institute for Strategic Studies, "The Middle East War," *Strategic Survey* 74 (April 1974): 55.

⁹⁹ Laslie, *Air Force After Vietnam*, 59; Michel, "Revolt of the Majors," 214-215.

¹⁰⁰ Lambeth, *Transformation of American Air Power*, 70.

¹⁰¹ Anderegg, *Sierra Hotel*, 100.

¹⁰² Laslie, *Air Force After Vietnam*, 69.

possible to avoid the anti-aircraft artillery, a far more formidable threat.¹⁰³

The US Air Force subsequently reverted to a medium altitude emphasis, with only some force elements maintaining a preference for low level navigation and attack. This reduced training losses and also promised to minimize combat attrition to AAA, man-portable SAMs and controlled flight into terrain. This revision of tactical emphasis was enabled by the maturity of the technical capabilities that had been catalyzed by the Yom Kippur War. These allowed the Air Force to “evolve toward a high technology system, based on real-time command and control, sophisticated defense suppression, and precision-guided munitions.”¹⁰⁴ The efficacy of this approach was demonstrated in practice in 1991.¹⁰⁵ During Desert Storm, the US Air Force lost only 13 fighters in a 43-day air campaign, having quickly abandoned low level attacks in the face of Iraqi defenses. General Creech later compared this loss rate to that of the British Royal Air Force - whose Tornado force remained wedded to a ‘go low’ mentality - concluding: “had the [US] Air Force had the same loss rate as the [British], we would have lost 160 fighters, not 13.”¹⁰⁶ The Yom Kippur War had thus encouraged US training and tactics to first move in one direction, toward low altitude tactics; but, as technologies that had themselves been inspired by Israeli experience matured, the US had developed improved techniques to overcome the SAM problem at lower risk to American aircrew. Technological and conceptual developments had interacted in an iterative, mutually reinforcing manner.

Capability Realization: The Gulf War

¹⁰³ Creech quoted in Laslie, *Air Force After Vietnam*, 69.

¹⁰⁴ Michel, “Revolt of the Majors,” 304.

¹⁰⁵ Lambeth, *Transformation of American Air Power*, 70.

¹⁰⁶ Creech quoted in Laslie, *Air Force After Vietnam*, 152.

Finally, it is instructive to compare briefly the developmental vectors established immediately after the Yom Kippur War - representing the Air Force's articulation of what it needed *to do* - with the post-1991 analysis of the Gulf War Air Power Survey (GWAPS) that reflected what, by the early 1990s, had *been done*. Dr Malcolm Currie, Director of Defense Research and Engineering, stated in testimony to the Senate in 1974 that the lessons of the Yom Kippur War "reinforced and expanded our initiatives in the areas of command and control, precision weapon delivery, air mobility, defense suppression and air defense."¹⁰⁷ The authors of the later GWAPS noted that during Desert Storm:

The United States provided all or almost all of the Coalition's command and control systems, electronic warfare aircraft, heavy bombers, cruise missiles, and stealth capabilities.... Some [capabilities] were based on *quality* (for example, stealth), others on a *quantity* so great that it brought a quality all of its own (for instance, aerial refueling and airlift).¹⁰⁸

Performance in specific capability categories, each of which had been influenced by the Yom Kippur War, supported these GWAPS conclusions. Airlift underpinned success in Desert Storm. At its peak, Coalition airlift flew approximately four times the combined tonnage/mileage that had been achieved in Operation Nickel Grass.¹⁰⁹ Tactically, the Air Force's focus on precision munition development yielded capabilities far beyond the other American services and Coalition allies. Air Force attack aircraft dropped 8,546 guided bombs, 90 percent of the US total, during Desert Storm, and also fired 96 percent (5,255) of

¹⁰⁷ Currie to Senate, 26 February 1974, *Hearings before the Committee on Armed Services*, 772.

¹⁰⁸ Keaney and Cohen, *Revolution in Warfare*, 153.

¹⁰⁹ Keaney and Cohen, *Revolution in Warfare*, 154.

the guided missiles - mainly Maverick - that were expended.¹¹⁰ While the bulk of munitions employed in 1991 were unguided 'iron bombs', with LGBs amounting to less than 5 percent of the ordnance dropped, these precision weapons allowed the successful attack of key targets and provided elements of risk-minimizing standoff, exactly the requirements that had been inferred from the Israeli experience in October 1973.¹¹¹ The Air Force contribution to air-to-air combat was no less spectacular: the E-3 AWACS, of which the Air Force provided eleven, enabled beyond visual range (BVR) engagements that accounted for more than 40 percent of the Coalition's air-to-air kills, the first time in history that such a high percentage of kills had been achieved in BVR engagements.¹¹² Air Force pilots claimed the majority of the 38 Iraqi aircraft that were shot down.¹¹³

Lessons derived from the attrition and expenditure statistics of October 1973 also paid off, as the available *quantity* of aircraft and materiel contributed to success in the Persian Gulf. A combination of prepositioning and in-conflict resupply meant that the Air Force was able to transfer roughly two-thirds of its LGB and Maverick stocks to theater, of which approximately one-half were expended.¹¹⁴ In contrast to the Israeli experience during the Yom Kippur War and mid-1970s forecasts of a European conflict, this ensured plentiful stocks both within the active theater of operations and back in the Continental US. The quantity issue was not perfectly resolved - the Air Force deployed more than 90 percent of its air refueling and LGB-capable assets to the Gulf, lacking redundancy in these areas - but overall "the air campaign was

¹¹⁰ Keaney and Cohen, *Revolution in Warfare*, 171.

¹¹¹ Keaney and Cohen, *Revolution in Warfare*, 191.

¹¹² Keaney and Cohen, *Revolution in Warfare*, 51, 208.

¹¹³ Keaney and Cohen, *Revolution in Warfare*, 49-50. This figure includes fixed and rotary wing aircraft.

¹¹⁴ Keaney and Cohen, *Revolution in Warfare*, 177.

never constrained by a lack of fuel, parts, [munitions] or maintenance capability, truly a remarkable accomplishment.”¹¹⁵

Overall, the developmental vectors established immediately after the Yom Kippur War underpinned American success in 1991. The Gulf War demonstrated the maturity of the offset strategy that had been pursued after 1973; moreover, this strategy was enduring. Echoing the primary themes of its 1975 predecessor, the 1992 Department of Defense Annual Budget Report, published soon after Desert Storm, concluded that “capable and survivable tactical air forces with sustainable global reach” would continue to be “key to this nation's success in meeting future challenges.”¹¹⁶ If the Gulf War did indeed represent a Revolution in Military Affairs, this was due in no small part to the influence of the Yom Kippur War.

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The Yom Kippur War had a significant catalyzing effect on the development of US Air Force capabilities. A variety of aircraft and weapons systems can be traced back through - or, as with the F-117, to - the lessons of October 1973. Advanced technology was, however, of little use if employed incorrectly, a lesson that the US Air Force had learned in Vietnam. The vicarious experience of the Yom Kippur War therefore encouraged parallel conceptual improvements, promoting realistic training regimes that yielded improved tactics, and these interacted in turn with advanced technical programs. The Air Force thus reshaped itself to achieve unparalleled results when faced with a simulacrum of the earlier Israeli conflict in 1991, and it achieved this reshaping in a

¹¹⁵ Keaney and Cohen, *Revolution in Warfare*, 173-174, munitions 178.

¹¹⁶ Department of Defense, *Report of the Secretary of Defense to the President and the Congress, February 1992* (Washington, D.C.: U.S. Government Printing Office, 1992), 84.

relatively short time. Fewer years elapsed between the Yom Kippur War and Operation Desert Storm - a little more than 17 - than between Desert Storm and the bombing of Libya in 2011. The Air Force weaved observations from Israeli experience into analysis of its own shortcomings and failures in Vietnam, and pursued revolutionary improvements in technology, training and tactics that remain relevant today.



Chapter 4

The Yom Kippur War and Air Force Doctrine: Operational Concepts and Operational Success

Tactics and training evolved after 1973 to exploit emerging technical capabilities, but each of these developmental strands interacted under broader operational themes. The Yom Kippur War influenced the evolution of Air Force doctrine in multiple ways. Here, the Air Force learned not only vicariously, but by *proxy*, as the US Army drove doctrinal changes that affected both land and air power. The key individual in this process was General Don Starry, head of the Army's Training and Doctrine Command (TRADOC) from 1977. Starry was profoundly influenced by Israeli experiences in 1973, and his TRADOC created the AirLand Battle doctrine that dominated US military thinking through the 1980s and channeled the Air Force into a joint operational construct. Even when later Air Force thinking pursued the independent application of air power - exemplified in the ideas of John Warden - the influence of the Yom Kippur War remained visible. Warden referenced the war in his theoretical works, and retained an emphasis on defense suppression as a key part of the control of the air mission. Moreover, Warden's proposed application of independent air power relied upon capabilities that had been informed by Israeli experience and then reinforced by AirLand Battle doctrinal requirements and concepts. Finally, Operation Desert Storm once again demonstrated the realization of the Yom Kippur War's influence on the 'Vietnam Generation.'

Conceptual maturation was evident not only in the organizational trends that enabled US success in 1991, but also in the understanding and attitudes of key individuals who planned and executed the air campaign in the Persian Gulf.

Learning by Proxy: The US Army, AirLand Battle, and the Air Force

While the Air Force focused on technical solutions to the challenges that had been perceived in October 1973, and the training reforms that would enable technology to become useful capability, the US Army took a deep look at the tactical and operational lessons of the Yom Kippur War and pursued sweeping doctrinal change. In terms of reforming emphasis, the Air Force prioritized improvements in the *tactical* means and ways of air warfare; the Army drove what would become a joint effort to develop the *operational* ways, and this influenced the overall mode and emphasis of Air Force operations as executed in the Persian Gulf in 1991.

The key individual in this process was US Army General Don Starry. Starry was commander of Fort Knox and the Army Center and School during October 1973, and he was sent to Israel on an Army fact-finding visit in January 1974.¹ Starry toured the Golan battlefield with Israeli General Musa Peled, commander of the Israeli Defense Forces Armored Corps. Paralleling General Dixon's experience in TAC, this visit initiated a longstanding relationship between Starry and senior Israeli officers, and this heavily influenced Starry in his later activities.² Starry drew key lessons from repeated visits to Israel, echoing the views of Air Force and external observers and incorporating both land and air issues into a joint perspective:

...we learned that the U.S. military should expect modern battlefields to be dense with large numbers of weapons systems whose lethality at extended ranges would surpass previous experience by nearly an order of magnitude...
Second, because of numbers and weapons lethality, the

¹ Lewis Sorley, ed., *Press On!: Selected Works of General Donn A. Starry*, Vol. 1 (Fort Leavenworth, KS.: Combat Studies Institute Press, US Army Combined Arms Center, 2009), x.

² Sorley, *Press On*, x-xi.

direct-fire battle will be intense, resulting in enormous equipment losses in a relatively short time... Third, the air battle will be characterized by large numbers of highly lethal aerial platforms... and by large numbers of highly lethal air defense weapons. Fourth, the density-intensity-lethality equation will prevent domination of the battle by any single weapons system; to win, it will be necessary to employ all battlefield systems in closely coordinated all-arms action... Finally, regardless of which side outnumbered the other... the outcome of battle at the tactical and operational levels will be decided by factors other than numbers and other than who attacks and who defends... battles will continue to be won by the... combat excellence of well-trained units.³

Starry noted the resilience of the early lessons he derived from the war: "For several years after [the conflict], TRADOC and other agencies in the United States would collect data, conduct analysis, and publish studies. All too often the height and breadth of data and information could be measured in kilometers, the depth of analysis in millimeters. In the end nothing changed significantly the conclusions we had drawn early on from walking the battlegrounds with those who had fought... listening to their descriptions of what had happened [and] availing ourselves of [their] penetrating operational analysis."⁴ He concluded that deep attack of Soviet-style echelons, and the joint suppression of enemy air defenses required to achieve those attacks, would be key to success on a European battlefield.⁵ In his later written recollections, Starry noted these Israel-derived lessons "framed the beginning of what grew into, some nine years later, the doctrine called AirLand Battle, a concept

³ Gen. Donn A. Starry, "Reflections," in *Press On!: Selected Works of General Donn A. Starry*, Vol. 1, ed. Lewis Sorley (Fort Leavenworth, KS.: Combat Studies Institute Press, US Army Combined Arms Center, 2009), 25-26.

⁴ Gen. Donn A. Starry, "TRADOC's Analysis of the Yom Kippur War," in *Press On!: Selected Works of General Donn A. Starry*, Vol. 1, ed. Lewis Sorley (Fort Leavenworth, KS.: Combat Studies Institute Press, US Army Combined Arms Center, 2009), 223.

⁵ Gen (Ret) Donn A. Starry, interview by Dr. Harold R. Winton, School of Advanced Airpower Studies, 13 May 1995.

of war at the tactical and operational levels that U.S. and coalition commanders employed in Operation Desert Storm.”⁶

Starry’s AirLand Battle was built upon foundations laid by Generals Dixon and William DePuy, who had worked in tandem as the commanders of TAC and TRADOC immediately after the Yom Kippur War. The Dixon/DePuy doctrine, outlined in the 1976 edition of Army Field Manual 100-5 (FM 100-5), *Operations*, and known as Active Defense, incorporated many tactical lessons from Israel’s experience in October 1973. For example, it integrated air and ground forces in its concept of defense suppression, emphasizing the reciprocal synergies required between joint forces on the modern battlefield.⁷ Here, Active Defense recognized that air power was not always *supporting* in nature. This had not been a prominent observation in the immediate aftermath of the war in the way that issues such as the lethality of modern battle had been; nonetheless, it had been noted by some external observers and within Air Force internal analysis. The Israeli raid across the Suez Canal on October 16 had shown that sometimes air must in fact be *supported* by other elements: establishment of control of the air by ground forces had in turn enabled the effectiveness of air support to ground troops. As Martin van Creveld observed: “If the air force has traditionally been used to clear the way for ground forces, the reverse may now become equally frequent.”⁸ Within the Air Force, then-Lieutenant Colonel Chuck Horner authored a talking paper for the Directorate of Operations, titled *Interdependence of Air and Ground Operations*, in which he observed that “Israeli ground forces enhanced Israeli Air Force operations.”⁹ Finally,

⁶ Starry, “Reflections,” 25.

⁷ Field Manual (FM) 100-5, *Operations*, 1 July 1976, 8-4.

⁸ Martin Van. Creveld, *Military Lessons of the Yom Kippur War: Historical Perspectives* (Beverly Hills: Sage, 1975), 36.

⁹ Lt Col C.A. Horner, Directorate of Operations, Air Staff Talking Paper, subject: Inter-dependence of Air and Ground Operations, 24 November 1974. Document is now declassified.

General Dixon had noted Israeli success in destroying SAM sites with ground forces during his March 1974 meetings with Peled, which DePuy had also attended.¹⁰

These observations carried through into revised Army doctrine. The 1976 edition of FM 100-5 stated: "The suppression of enemy air defenses requires a coordinated Air Force/Army effort."¹¹ The mutually supporting nature of the suppression mission continued to be expressed in later concepts, and was expanded beyond Army doctrine to the Air Force's own high-level documents. The 1992 edition of Air Force Manual 1-1, *Basic Aerospace Doctrine of the United States Air Force*, cited the Israeli attack across the Suez Canal as an example of useful air-ground synergy, in which "[land] forces can be an especially effective means for degrading the enemy's surface-based aerospace defenses."¹² Both Army and Air Force doctrine noted in enduring revisions that air power was not always *supporting* in nature, but might in fact be *supported* by ground forces.

Active Defense was, however, perceived overall to be excessively reactive, and too focused upon firepower and the close fight instead of maneuver and multiple-echelon engagements.¹³ General Starry, mindful of the lessons of 1973, sought to extend the scope of the doctrine to the operational level of warfare.¹⁴ He worked closely with General Creech at TAC, knowingly building upon the legacy of the earlier cooperation between Dixon and DePuy.¹⁵ Much of the work between TRADOC and

¹⁰ Gen Robert J. Dixon, Commander, Tactical Air Command, to Gen George S. Brown, Chief of Staff, United States Air Force, letter, 12 March 1974, 3. Document is now declassified.

¹¹ FM 100-5 (1976), 8-4.

¹² Air Force Manual (AFM) 1-1, *Basic Aerospace Doctrine of the United States Air Force*, 1 March 1992, 140-141, 145.

¹³ Benjamin S. Lambeth, *The Transformation of American Air Power* (Ithaca, NY: Cornell University Press, 2000), 85; Starry, "Reflections," 27-28.

¹⁴ Starry, "Reflections," 27-28.

¹⁵ Gen. Donn A. Starry, "Offensive Air Support - Message to General E.C. Meyer 22 February 1980," in *Press On!: Selected Works of General Donn A. Starry*, Vol.

TAC was informal to maintain flexibility and relevance, and to avoid the bureaucratic inertia endemic to the Pentagon that Starry described as “Pentacrete.”¹⁶ This informal mode of working was fruitful: Starry praised Creech’s “endorsement of our AirLand concept and his willingness to work with us for mutual benefit”, and later summarized: “The Army, the nation, the Armed Forces owe Bill Creech a great, great debt of gratitude. We would not have AirLand Battle had it not been for him. I could not have carried that off by myself.”¹⁷ Here, Starry acknowledged that while he had been the driving force behind doctrinal reform, TAC and General Creech had been essential co-actors in achieving useful change.

The formal output of these joint efforts was the 1982 edition of FM 100-5, published after Starry had handed over command of TRADOC but very much the product of his vision and drive - which were themselves the product of his analysis of the Israeli experiences of October 1973. The 1982 edition of FM 100-5 laid out the principles of AirLand Battle. Starry summarized the doctrine as “an operational level concept; it combined the best tactical lessons of the Yom Kippur War with operational-level schemes designed to defeat Soviet operational-level concepts.”¹⁸ Air-ground synergy was fundamental to the doctrine, as its title clearly suggested.¹⁹ The emphasis was weighed toward air support to the land campaign, but this included control of the air and interdiction vice simple close air support, and the doctrine retained Active Defense’s

1, ed. Lewis Sorley (Fort Leavenworth, KS.: Combat Studies Institute Press, US Army Combined Arms Center, 2009), 6.

¹⁶ Starry, interview by Winton.

¹⁷ Gen. Donn A. Starry, “Army-Air Force Cooperation - Message to General E.C. Meyer 30 March 1981,” in *Press On!: Selected Works of General Donn A. Starry*, Vol. 1, ed. Lewis Sorley (Fort Leavenworth, KS.: Combat Studies Institute Press, US Army Combined Arms Center, 2009), 9.

¹⁸ Starry, “Reflections,” 28.

¹⁹ Field Manual (FM) 100-5, *Operations*, 20 August 1982, 7-1.

articulation of mutually supporting joint SEAD.²⁰ Starry outlined the fundamental tenets of the doctrine in a presentation at the Air University, Maxwell AFB, in March 1980:

...we must *see deep* - into the enemy second echelons - and establish a picture of what the enemy is doing. We must *move fast* to concentrate firepower to oppose his maneuver and... disrupt his operational scheme. Those firepower and maneuver forces must *strike quickly*... We, on the ground, can't do that very well, and we must depend on the Air Force... Our force structures - Army and Air Force - must be designed to be complementary and supplementary, not competitive. It's not a roles and missions fight, it's a fight for survival against an enemy who has a significant edge over us. We need everything that each service has to offer the other.²¹

AirLand Battle influenced the Air Force in many ways. It further directed equipment programs that complemented those prioritized immediately after 1973. The primacy of information and the need for target acquisition capabilities drove the Joint Surveillance Target Attack Radar System, or JSTARS, program.²² Likewise, the Army was a key potential consumer of imagery that could be obtained by unmanned air systems, which demonstrated their utility in Israeli operations in the Bekaa Valley in 1982, the year that AirLand Battle was published.²³ The doctrine also led to the creation by Army and Air Force chiefs of staff of a list known as the "thirty-one initiatives", which included joint munitions programs and the extension of conventional interdiction roles to SAC

²⁰ John Andreas Olsen, *John Warden and the Renaissance of American Air Power* (Washington D.C.: Potomac Books, 2007), 103; FM 100-5 (1982), 7-11, 7-12.

²¹ Gen. Donn A. Starry, "Force Structure - Air University Airpower Symposium 5 March 1980," in *Press On!: Selected Works of General Donn A. Starry*, Vol 1, ed. Lewis Sorley (Fort Leavenworth, KS.: Combat Studies Institute Press, US Army Combined Arms Center, 2009), 461.

²² Starry, "Reflections," 28.

²³ Starry, "Reflections," 30.

assets, such as the B-52.²⁴ AirLand Battle thus reinforced the technical emphasis that the Air Force had pursued since 1973, further driving Yom Kippur War-influenced acquisition and development emphases with a doctrine that was itself a product of Israeli experiences. Those technical programs and supporting training reforms encouraged the emergence of a changed organizational focus, in which even “strategic” assets would support the Army on the battlefield.²⁵ This in turn contributed to a “rise of the fighter generals” and the ascendancy of TAC as the most influential Air Force command.²⁶ The Air Force that fought in Desert Storm was thus in many ways a post-‘strategic’ and post-‘tactical’ organization, with platform-derived distinctions increasingly blurred, although formal reorganization did not occur until 1992 with the creation of Air Combat Command.²⁷ Overall, AirLand Battle did much to channel the capabilities and focus of the US Air Force. Here, the Yom Kippur War affected air power at the operational level through its impact on *land* power, and via a senior soldier, Don Starry, who had been profoundly influenced by the Israeli experience of October 1973.

The Airman’s View of Air Power: The Yom Kippur War and John Warden

The US Air Force that fought in January 1991 was not, though, *entirely* the product of an army-originated doctrine. Individuals within the Air Force had also conducted their own conceptual thinking, albeit following the Army’s lead, and this contributed to aspects of Desert Storm that went beyond the deep interdiction envisaged by Don Starry

²⁴ Lambeth, *Transformation of American Air Power*, 86.

²⁵ Lambeth, *Transformation of American Air Power*, 88, 91.

²⁶ Michael R. Worden, *Rise of the Fighter Generals: The Problem of Air Force Leadership 1945-1982* (Maxwell Air Force Base, AL: Air University Press, 1998), 211, 220-222.

²⁷ Olsen, *John Warden and Renaissance*, 124.

and supported by Bill Creech. The Gulf War was characterized less by air support to active ground operations than by an extended ‘preparation of the battlefield’ phase that blurred into the *destruction of the Iraqi army* from the air, while the Air Force also prosecuted strikes against leadership and infrastructure targets in Baghdad.²⁸ These aspects of the 1991 air campaign were the result of organic Air Force thinking, specifically the work of Colonel John Warden, whose most significant ideas included the model of an enemy regime as a system comprising centers of gravity within five interconnected “rings²⁹.” Warden codified much of this into an air-only campaign plan with which to defeat Iraq, codenamed Instant Thunder.³⁰ While Instant Thunder was not prosecuted in a ‘pure’ form, much of its targeting emphasis survived into Desert Storm, and Warden’s influence extended beyond 1991 into a renewed Air Force focus on ‘independent’ conventional air attack.³¹ Warden therefore added a ‘blue’ conceptual strand alongside the joint doctrine of AirLand Battle; and he, like Starry, was influenced by the Yom Kippur War, both in his individual understanding of air warfare and in his conceptual reliance on capabilities that were the result of post-1973 trends.

Warden’s air power ideas were underpinned by an emphasis on the requirement to obtain and maintain control of the air, and here Warden’s developing thoughts were clearly influenced by Israeli experience. Warden, an F-15 pilot, had expressed his early views that air superiority rather than close air support should be the prime focus of tactical US air

²⁸ Lt Col David Deptula quoted in Keith L. Shimko, *The Iraq Wars and America's Military Revolution* (New York, NY: Cambridge University Press, 2010), 69; Thomas A. Keaney and Eliot A. Cohen, *Revolution in Warfare? Air Power in the Persian Gulf* (Annapolis, MD: Naval Institute Press, 1995), 33-42.

²⁹ John A. Warden III, “Smart Strategy, Smart Airpower,” in *Airpower Reborn: The Strategic Concepts of John Warden and John Boyd*, ed. John Andreas Olsen, (Annapolis, MD: Naval Institute Press, 2015), 106-109.

³⁰ Olsen, *John Warden and Renaissance*, 289-293.

³¹ Olsen, *John Warden and Renaissance*, 280-281.

power in a 1972 essay titled *Employment of Tactical Air in Europe*.³² Then, in August 1975, Warden was posted to the Middle East and Africa Division within the Air Force Planning Directorate in the Pentagon, which was still dominated by the repercussions and lessons of the Yom Kippur War.³³ His familiarity with Israeli experience in 1973 was readily apparent in his later theoretical ideas. Warden's defining work, *The Air Campaign*, published in 1988, referenced the Yom Kippur War repeatedly. Warden used the war as his primary example of the criticality of air superiority in modern warfare. He asserted that the Israelis "paid a terrible price [in October 1973] for not gaining air superiority in the first phase of the war. Only after recognizing the need to suppress enemy missile systems -- their primary barrier to air superiority -- were they able to turn the tide of battle and go on to win the war."³⁴ Warden also used the 1973 conflict to show that he - like Peled, Dixon, Starry and Horner - recognized the *joint* nature of the control of the air mission, noting that: "Israeli gunboats [had] attacked Egyptian surface-to-air missile systems on the Egyptian left flank, to pave the way for Israeli air force movements through the opened corridor... at about the same time that General Sharon crossed the canal and destroyed several [SAM] batteries by ground attack."³⁵

Warden's use of the Yom Kippur War was not restricted to supporting his views on control of the air. He highlighted Israeli Air Force attacks on Syrian fuel and ammunition reserves to stress the utility of air interdiction over close air support.³⁶ Here, Warden corroborated the doctrinal emphasis of AirLand Battle, but he moved beyond this by using the Yom Kippur War to illustrate his developing

³² Olsen, *John Warden and Renaissance*, 23.

³³ Olsen, *John Warden and Renaissance*, 33.

³⁴ John A. Warden III, *The Air Campaign: Planning for Combat* (Washington, DC: National Defense University Press, 1988), 16.

³⁵ Warden, *The Air Campaign*, 19, 36.

³⁶ Warden, *The Air Campaign*, 96-97.

views on using conventional air forces for strategic attack. He noted approvingly that the Israelis had attacked economic and political targets in Syria to force the withdrawal of air defense assets from the Golan front.³⁷ Warden also made wider references to Israeli Air Force trends and operational technique, discussing aspects of the 1967 Six Day War, the 1981 raid against the Osirak nuclear reactor in Iraq, and the 1982 operation to destroy Syrian air defenses in the Bekaa Valley. In all, *The Air Campaign*'s use of Israeli experience was roughly equal to its emphasis upon the direct lessons of Vietnam. Warden referenced the Yom Kippur War repeatedly, in contexts ranging from air superiority through to his developing ideas of strategic attack against critical nodes.

Warden's Instant Thunder plan for Desert Storm represented the maturation of the ideas expressed in *The Air Campaign*. Critical aspects of the plan relied upon capabilities such as suppression, stealth and precision attack that were themselves the product of developmental vectors established by the Yom Kippur War. In this way, Warden's ideas, *directly* informed by Israeli experience, were *indirectly* enabled by organizational capabilities that had themselves been influenced by the lessons of October 1973. Perhaps the best example of this was the combination of two "icons" of modern air warfare - stealth and precision weapons - in F-117 attacks against command and control facilities in Baghdad.³⁸ The object of these attacks reflected the ideas of Warden as an *individual*, while the enabling nature of the means employed was the result of *organizational* developments. Similarly, Warden's use of vicarious Israeli experience continued when supporting the developing Desert Storm air campaign from his position in the Pentagon-based 'Checkmate' think tank. He suggested the use of unmanned aircraft as

³⁷ Warden, *The Air Campaign*, 37.

³⁸ Frans P.B. Osinga, "The Enemy as a Complex Adaptive System: John Boyd and Airpower in the Postmodern Era," in *Airpower Reborn: The Strategic Concepts of John Warden and John Boyd*, ed. John Andreas Olsen (Annapolis, MD.: Naval Institute Press, 2015), 82-83.

decoys against Iraqi SAMs based upon Israeli success in the Bekaa Valley 1982.³⁹ Again, Warden's idea was based upon Israeli experience, but it was also reliant upon technical means that themselves had some link to the lessons of the October 1973. These developmental strands - conceptual and physical - influenced each other in a reinforcing, interactive process that resulted in some of the most striking aspects of the Gulf War.

Influential - and *Influenced* - Individuals in Operation Desert Storm

Finally, the experiences of the officers charged with executing Operation Desert Storm once again demonstrated the interactive influences of the Yom Kippur War on individuals and the broader organization. Both Brigadier General Larry L. Henry, the architect of the electronic warfare campaign plan for Operations Desert Shield and Desert Storm, and the now-Lieutenant General Horner, appointed Joint Force Air Component Commander for the Gulf campaign, were influenced by their familiarity with the events of October 1973.

Brigadier General Henry specifically credited Israeli experiences as having inspired his concept of operations for Desert Storm.⁴⁰ He had co-authored a paper while a student at the National War College in 1983 that compared Israeli failures in 1973 with the success achieved in the Bekaa Valley in 1982. Henry and his co-authors interviewed US and Israeli officials and noted the contribution of the lessons of 1973 to the focused Israeli plan in 1982.⁴¹ They also highlighted the relevance of

³⁹ Olsen, *John Warden and Renaissance*, 199-200.

⁴⁰ Diane T. Putney, *Airpower Advantage: Planning the Gulf War Air Campaign 1989-1991* (Washington D.C.: Air Force History and Museums Program, 2004), 103.

⁴¹ Col Gordon M Clarke et al, "The 1982 Israeli War in Lebanon: Implications for Modern Conventional Warfare," Strategic Studies Project, National War College, 1983, 16-17.

joint operations and qualitative superiority in weapons systems.⁴² Henry carried this analysis forward into his own planning for Desert Storm, seeking to emulate the Israeli successes of 1982 - and avoid the failures of October 1973 - by denying Iraqi forces a SAM 'umbrella' of the type enjoyed by Egyptian forces in the Suez Canal zone.⁴³ Moreover, and as had been the case with Warden, the plan that Henry delivered was made viable by a suite of capabilities that owed their genesis at least partly to the lessons of October 1973. In later interviews, and with specific reference to his earlier studies at the National War College, Henry stated: "Israeli combat experience in 1973 and 1982 had influenced [his] concept of operations" in 1991.⁴⁴

General Horner was less categorical in linking his Desert Storm leadership to earlier analysis of the Yom Kippur War, emphasizing his own Vietnam experience in post-1991 recollections. However, Horner, like his peers, was a member of the Air Force generation that was influenced by the Israeli experience on an organizational level; moreover, and as earlier referenced, he had completed a staff tour in the Operations Directorate during which in his own words he "studied the 1973 Middle East war in detail."⁴⁵ It is reasonable to infer that this mid-career experience shaped enduring views, and his leadership in 1991 does indeed suggest a merging of Vietnam and Yom Kippur War lessons in his attitude to air operations. Specifically, Horner's assessments of the appropriateness of low level tactics, the utility of air-ground synergies, and the need to target of an enemy's fielded forces with air power, were coherent with both his own Vietnam experience and the in-depth

⁴² Clarke et al, "The 1982 Israeli War," 22, 31-32.

⁴³ Putney, *Airpower Advantage*, 104.

⁴⁴ Putney, *Airpower Advantage*, 103, referencing interview with Henry in July 1997.

⁴⁵ Horner quoted in Horner and Tom Clancy, Gen (Ret) Chuck Horner, and Tony Koltz, *Every Man a Tiger: The Gulf War Air Campaign* (New York: Berkley Books, 2005), 105.

analysis of the Yom Kippur War that he completed while on the staff of the Operations Directorate in the Pentagon.

During Desert Storm, Horner ordered the suspension of low-altitude attacks after the loss of multiple aircraft during the first week of the war, including an F-15E Strike Eagle and, notably, five Royal Air Force Tornado GR1s.⁴⁶ Horner's decision was not isolated from his underlying attitudes; by his own later admission, he had a longstanding aversion to the risks of low altitude tactics. Horner had flown in the Air Force's first SAM suppression mission during Vietnam.⁴⁷ The raid, flown on 27 July 1965 in response to the downing of two F-4 Phantoms by North Vietnamese missiles, had been a disaster. Mission planning was poor, with identical low-level attack routes planned for multiple 4-ship elements. Six of the attacking F-105s were lost to anti-aircraft guns or controlled flight into terrain, with only one of the pilots subsequently recovered. Horner himself had been unable to prosecute his attack successfully, concentrating almost entirely on avoiding terrain and AAA fire.⁴⁸ Horner concluded that although low-level tactics negated the SA-2 threat, with aircraft able to remain below the system's minimum engagement altitude, aircrew were instead exposed to intense AAA and "every man, woman and child with an automatic weapon."⁴⁹ In an interview after Desert Storm, he summarized:

I learned a lesson that day the hard way .. not only did we lose a bunch of airplanes but we had a bunch of airplanes shot up... I came away with the conclusion that low level was

⁴⁶ Kitfield, *Prodigal Soldiers*, 389, but note that - contrary to Kitfield's figures - five rather than six Tornado aircraft were lost at low level during the first week of the war. See Royal Air Force, "Statement on the Loss of RAF Tornado Aircraft in Combat During the Conduct of Air Operations against Iraq." F-15E loss: William L. Smallwood, *Strike Eagle: Flying the F-15E in the Gulf War* (Washington D.C.: Potomac Books, 2005), 96.

⁴⁷ Kitfield, *Prodigal Soldiers*, 51-52.

⁴⁸ Kitfield, *Prodigal Soldiers*, 53-55.

⁴⁹ Kitfield, *Prodigal Soldiers*, 79.

a non-starter... you don't want to go low altitude, you're giving everybody a shot.⁵⁰

It is likely that Horner's analysis of the Yom Kippur War during his tour in the Operations Directorate reinforced these views.⁵¹ Data such as that recorded by the USMEVTI showed significant Israeli attrition to AAA and the low altitude, short range SA-7.⁵² This mirrored Horner's own experience in Vietnam. Moreover, the tactical effectiveness of Israeli low-level weapon releases had been ambiguous, as evidenced by post-war Israeli and American focus on precise standoff weaponry, and the Israelis acknowledged the stresses of flying at altitudes as low as 20 feet.⁵³ While at the Operations Directorate, Horner also authored a talking paper that assessed ongoing US Air Force technical programs against the initial lessons of the Yom Kippur War. In this, he emphasized electronic counter measures, Wild Weasel aircraft, and suppression weapons, making no recommendations for low-level navigation or attack capabilities.⁵⁴ While Horner's post-1991 comments emphasized the role of his own Vietnam experience in forming his attitude towards low level tactics, it is reasonable to infer that Horner's detailed study of the Yom Kippur War reinforced his Vietnam-derived views, even as others drew alternative conclusions from the Israeli experience and, as discussed in Chapter Three, chose to 'go low.'

Horner also maintained a focus on air support to the land battle and highlighted the importance of targeting enemy fielded forces. He famously objected to John Warden's original Instant Thunder plan that

⁵⁰ Gen C.A. Horner, Interview by PBS, transcript at PBS.org.
<http://www.pbs.org/wgbh/pages/frontline/gulf/oral/horner/1.html>.

⁵¹ Horner quoted in Clancy et al, *Every Man a Tiger*, 105.

⁵² See Chapter 2, Table 1.

⁵³ Dixon to Brown, letter, attachment, 5.

⁵⁴ Lt Col C.A. Horner, Directorate of Operations, Air Staff Talking Paper, subject: Mid East War Data Support of USAF Programs, 24 November 1973. Document is now declassified.

completely ignored Iraqi troops and armored formations.⁵⁵ Horner retained much of Warden's proposed target list but insisted on targeting Iraqi troops.⁵⁶ This attitude was coherent with both the prevailing AirLand Battle doctrine that had been inspired by the Yom Kippur War, and Horner's own observations of Israeli combat in October 1973. It is again relevant to note the content of his staff output at the Operations Directorate. In a talking paper of November 1973, *Interdependence of Air and Ground Operations*, Horner noted repeatedly that Israeli air support had been critical to success on the ground. Horner observed that the "Air Force enhanced Army operations... [it] blunted armor thrusts... Air interdiction efforts disrupted Arab movements of reserve forces... Over 4,000 A-4 sorties [were] committed for support of ground forces."⁵⁷ The overall tone was approving, and suggested that Horner was likely a ready subscriber to the doctrinal emphases of first Active Defense and then AirLand Battle. This assessment is in turn supported by Horner's rejection of John Warden's Instant Thunder plan as originally presented.

While it is impossible to state the extent to which Horner's awareness of history influenced his decisions when confronted with "half a million" Iraqi troops on the Kuwait border, neither is it likely that his familiarity with the Yom Kippur War played no role at all in his attitude and decisions.⁵⁸ As a staff officer, Horner had studied an Israeli experience in which qualitatively superior troops had been unable to repel Arab attacks without heavy losses, and in which Israel's air force had played a key role in by targeting Arab forces. In accordance with cognitive trends identified by the political scientist Robert Jervis, Horner may have learned *most* from his own early experiences in Vietnam, but he perhaps learned *best* from his studies of combat over the Suez Canal

⁵⁵ Olsen, *John Warden and Renaissance*, 179-181.

⁵⁶ Olsen, *John Warden and Renaissance*, 186-187.

⁵⁷ Horner, *Interdependence*.

⁵⁸ Horner, interview with PBS.

and the Golan Heights in October 1973.⁵⁹ He was therefore a product of more than just his own combat experience; the attitudes of Lieutenant General Horner, Joint Force Air Component Commander during the Gulf War, owed at least something to the vicarious experience gained by the younger Lieutenant *Colonel* Horner at the Pentagon.

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Henry and Horner were members of a post-Vietnam generation that was influenced by more than just the American war in Southeast Asia. They executed plans and directed capabilities that were the products of multiple interacting factors. The Yom Kippur War had established developmental vectors for technical programs, training, tactics and doctrine. Inherently linked, these developmental strands reinforced each other as they collectively matured. The resulting capabilities reflected the hybrid lessons of Vietnam *and* the Yom Kippur War. These capabilities cohered within revised doctrine that was itself profoundly influenced by Israeli experiences, and this doctrine in turn encouraged further capability change. At the heart of these organizational processes were *individuals*, representing both the Air Force and the Army: Dixon, Creech, Suter, DePuy, Starry, Warden, Henry, and Horner. These reformers and leaders each assimilated the lessons of the Yom Kippur War, before together forging an unparalleled American instrument of air power.

⁵⁹ Robert Jervis, *Perception and Misperception in International Politics* (Princeton, NJ: Princeton University Press, 1976), 246.

Conclusion

An American-Israeli Way of War

...the Yom Kippur War of October 1973 stimulated much thought in the United States, including evaluation and reaction that was perhaps keener than the evaluation and reaction to US experience in Southeast Asia.

Robert Frank Futrell
Basic Thinking in the United States Air Force 1961-1984

The Yom Kippur War had a fundamental influence on US Air Force equipment, training, tactics and doctrine. The war captured the attention of civilian and military observers alike. The Air Force participated in a number of joint and single service analyses and drew pertinent conclusions in a wide range of mission areas. Primary lessons focused on the lethality of the modern battlefield and the threat of ground based air defense systems; requirements for defense suppression, targeting, and platform survivability; the importance of quantity as well as quality in attrition-intensive warfare; and the need for airlift capabilities to transport the vast quantities of materiel necessary to sustain military operations. These lessons catalyzed or initiated the acquisition of technological 'offsets' to the Soviet threat in Europe. The war also energized training reforms, which interacted in turn with new equipment to encourage the evolution of ever more effective tactics. All this influenced - and was further influenced *by* - doctrinal changes that were themselves informed by Israeli experiences in October 1973. Key individuals drove these organizational reforms. Members of the 'Vietnam Generation' leveraged Israeli experience as they rehabilitated American air power, achieving stunning rebirth in the Persian Gulf in 1991.

There is, however, a final, overarching legacy of the Yom Kippur War that explains its essential influence on the US Air Force. The war

reinforced an 'American way of war' characterized by a focus on high-end regular warfare. The battle-oriented conflict of October 1973 was entirely consistent with this paradigm, and confirmed an institutional tendency to assimilate only the regular lessons of the air war over Vietnam. This view of 'war as battle' has produced unparalleled success in conventional conflicts; it has also, however, created recurring challenges when employing American air power in contexts other than high intensity, regular war.

This understanding of 'war' as 'battle' is also evident in an American-Israeli military parallelism that can be traced back to the Yom Kippur War. US and Israeli air power have tracked similar developmental paths since 1973. In many cases, Israel tested American technologies in combat, allowing the US to continue a theme of vicarious learning. Israel has also, however, exhibited its own pseudo-American way of war, and has experienced equally conflicting results in irregular warfare, notably in Lebanon between 1982 and 2000 and again in 2006. Challenges in broadening a conventional warfare paradigm to incorporate low-intensity conflict have therefore characterized both the Israeli and American experience in recent decades. Each air force has adapted to an extent, for example in the use of air power for precise targeting of key individuals. However, this enduring tension between peerless regular capabilities and problematic irregular warfare represents a lingering American-Israeli legacy of the Yom Kippur War.

At the High End: War as Battle

The historian Russell Weigley first articulated the concept of an American way of war in 1973. Writing as the US withdrew from Vietnam, but before the Yom Kippur War, Weigley argued:

In the Indian wars, the Civil War, and then climactically in World War II, American strategists sought in actuality the object that Clausewitz saw as that of the ideal type of war... the destruction of the enemy's armed forces... When American military resources were still slight, America made a promising beginning in the nurture of strategists of attrition; but the wealth of the country, and its adoption of unlimited aims in war cut that development short, until the strategy of annihilation became characteristically the American way in war.¹

Beyond this focus on the annihilation of an enemy, Weigley also asserted: "A central theme of the history of American strategy came to be the problem of how to secure victory in its desired fullness without paying a [high] cost."² The resulting American way of war has been characterized as "technology-loving and technology-dependent... firepower-oriented...aggressive and offensive... profoundly regular... [and] frequently tone deaf to the historical [and cultural] context it is operating in."³ Expressed in more general terms, this understanding identifies the phenomenon of 'war' very closely with its sub-component, 'battle', and on a large scale. The American military has been most effective when faced with situations that conform to this paradigm of battle-oriented warfare and, by contrast, it has been "uncomfortable waging war with constrained means for limited or ambiguous objectives."⁴

Individual attitudes and perceptions have been fundamental to the formation of this organizational outlook. Historian Brian M. Linn contends that "how military officers perceive their 'lessons'... creates a

¹ Russell F. Weigley, *The American Way of War: A History of United States Military Strategy and Policy* (Bloomington and Indianapolis: Indiana University Press, 1973), xxii.

² Weigley, *American Way of War*, xxii.

³ John Andreas Olsen, "Airpower and Strategy," in *Airpower Reborn: The Strategic Concepts of John Warden and John Boyd*, ed. John Andreas Olsen (Annapolis, MD: Naval Institute Press, 2015), 190 (footnote 97).

⁴ Thomas G. Mahnken, *Technology and the American Way of War since 1945* (New York: Columbia University Press, 2010), 3.

“way of war.” The military intellectuals' interpretation of the past shapes their service's concept of war, which in turn influences its procurement, organization and training, doctrine, and planning for future conflicts.”⁵ Naval War College professor and former Deputy Assistant Secretary of Defense Thomas G. Mahnken argues these “intellectuals” have tended to pursue innovation in accordance with established service culture and preferences.⁶ As a result, an American strategic outlook focused on high-end regular warfare has been self-reinforcing, and has tended to reject unconventional and therefore ‘uncomfortable’ forms of armed conflict.

The Yom Kippur War therefore represented an exemplar and affirming conflict fitted to American conceptions of war. Arab and Israeli forces engaged in ‘profoundly regular’ battles that constituted a kind of Second World War redux, on a miniature geographical scale. The conflict was also impactful in its timing. It occurred immediately after the end of an ‘uncomfortable’ mismatch between the preferred American mode of conflict and an incompatible context in Vietnam. The effect was to build on analytical trends that already privileged regular over irregular aspects of the war in Southeast Asia. Early Air Force analysis had focused on air-to-air exchange rates in studies such as the Red Baron report.⁷ The Easter Offensive had introduced a regular opponent into the conflict, and the Air Force had targeted North Vietnamese Army formations with far more success than it had been experienced when trying to destroy irregular Vietcong forces earlier in the war.⁸ In addition, the perceived success of the Linebacker II campaign contributed to a renewed sense of

⁵ Brian McAllister Linn, “The American Way of War Debate: An Overview,” *Historically Speaking* 11, no. 5 (November 2010): 22.

⁶ Mahnken, *Technology and the American Way of War*, 11.

⁷ Brian D. Laslie, *The Air Force Way of War: U.S. Tactics and Training After Vietnam* (Lexington, KY: University Press of Kentucky, 2015), 20.

⁸ Phil Haun and Colin Jackson, “Breaker of Armies: Air Power in the Easter Offensive and the Myth of Linebacker I and II in the Vietnam War,” *International Security* 40, no. 3 (2016): 139.

air power's inherent utility, represented by B-52 raids against North Vietnam that were thematically similar to the strategic bombing campaigns of the Second World War.⁹ The Air Force therefore focused on regular aspects of the Vietnam war, such as air-to-air combat and attacks on conventional military targets, as it contemplated the training reforms that the Yom Kippur War further energized. The Air Force's emblems of Vietnam were MiG-killing Phantoms, SAM-hunting Wild Weasels, and B-52 raids against fixed targets, and many of these reappeared in the skies over the Sinai and the Golan.

Conversely, 'uncomfortable' lessons derived from the irregular war experience in Vietnam were "forgotten before they were assimilated", and the spectacle and timing of the Yom Kippur War contributed to this process.¹⁰ Alternative icons of the war in Southeast Asia - Vietcong guerrillas operating among peasant populations - would have captured the essence of the conflict rather better; however, these were problematic for an American view of 'war as battle.' As a result, by the early 1980s the US military had "closed the door" on irregular warfare such as that experienced in Vietnam and was hoping "that there will be a conventional war if there is a war and we'll use our conventional forces."¹¹ The typical US military response had been to blame the difficult context in Southeast Asia rather than critically engage with it. For example, Air Force General William Momyer, who as deputy air commander in Vietnam had been responsible for the Rolling Thunder campaign during the 1960s, published a postwar analysis in which he "associated the shortcomings of the Vietnam conflict with failure to follow the principles of air power."¹²

⁹ Mark Clodfelter, *The Limits of Air Power: The American Bombing of North Vietnam* (New York: Free Press, 1989), xiii.

¹⁰ Donald J. Mrozek, *The US Air Force After Vietnam: Postwar Challenges and Potential for Responses* (Maxwell AFB, AL: Air University Press, 1988), 28.

¹¹ Lt Gen William P. Yarborough, quoted in Mrozek, *US Air Force After Vietnam*, 27-28.

¹² Mrozek, *US Air Force After Vietnam*, 16.

Momyer blamed contextual factors, including political constraints, for compromising a proper application of air power. In effect, the Air Force had not failed in Vietnam; the irregular aspects of the war had failed the Air Force.

Momyer's view typified an interpretation of air power that "limited its validity and utility in other than general or total war between industrialized states" and "would prove a major handicap in counterinsurgency warfare", both in Vietnam and after.¹³ This view ignored the reality that "the possible military obligations of the United States ranged widely over the spectrum of intensity."¹⁴ War would not *always* equate to regular battle. This reality, however, was further obscured by the immediate spectacle of an Arab-Israeli war that fit firmly within the band of the intensity spectrum that the Air Force was predisposed to focus upon. If the American military had indeed been tone deaf to contextual issues in Southeast Asia, then the Yom Kippur War was a symphony of violent battle that was easily heard, and readily understood. The nature and timing of the Arab-Israeli conflict contributed to a process in which considerations of regular warfare in Vietnam were privileged by the US military, and potentially useful irregular warfare lessons were discarded.

The Air Force constructed after 1973 was therefore the product of regular warfare lessons derived from Vietnam combined with analysis of the profoundly regular Yom Kippur War. The resurgent air power instrument unveiled in the Gulf War was also therefore 'profoundly regular' in its force structures, capabilities, and focus. The means and ways employed in Desert Storm were entirely consistent with an American way of war, and so too was the operational context. The Air

¹³ James S. Corum and Wray R. Johnson. *Airpower in Small Wars: Fighting Insurgents and Terrorists* (Lawrence, KS.: University Press of Kansas, 2003), 270.

¹⁴ Mrozek, *US Air Force After Vietnam*, 17.

Force found a thematic successor to the Yom Kippur War in January 1991 and achieved spectacular results against regular Iraqi opponents. This success was repeated, once more against conventional Iraqi forces, in March 2003. The primacy of American air power in paradigm-consistent conflicts - in 'war' as 'battle' - epitomized the military strength behind the post-Cold War "unipolar moment" and subsequent American hegemony in interstate relations.¹⁵ In 1991, and again in early 2003, the US Air Force showed that it had mastered its way of war.

Not all war since Desert Storm, however, has been characterized by battle. In the Balkans during the 1990s, and in Iraq and Afghanistan after mid-2003, American air power has faced challenges for which its paradigmatic focus has proved an uncomfortable fit. From a strategic point of view, the result has been a mismatch between means and contextually viable ends, echoing the experience in Vietnam. British academic Alice Hills has noted that the offensive application of air power is problematic in irregular and urban conflicts, and "could not stop looting in Baghdad, or ethnic cleansing in Kosovo."¹⁶ Mary Kaldor has identified a more fundamental tension between "old" and "new" war, with the former typified by regular warfare norms that are poorly suited to the complex irregular forces, endemic violence against civilians, and political constraints that define the latter.¹⁷ Kaldor focused on NATO experience in the Balkans, and the Kosovo example is instructive. Adopting a line that echoed that of his predecessor William Momyer, Air Force Lieutenant General Michael Short complained that political constraints, and especially an inability to strike targets in Belgrade, prevented the

¹⁵ Charles Krauthammer, "The Unipolar Moment," *Foreign Affairs* 70, no. 1 (1990): 23-33.

¹⁶ Alice Hills, *Future War in Cities: Rethinking a Liberal Dilemma* (London: Frank Cass, 2004), 74.

¹⁷ Mary Kaldor, *New and Old Wars: Organized Violence in a Global Era* (Stanford, CA.: Stanford University Press, 2013), vi-vii.

effective application of NATO air power.¹⁸ Confounded by circumstance, and attempting to employ forces and doctrine that had been configured entirely in accordance with the regular precepts of the traditional American way of war, Short argued, as Momyer had, that the Air Force was being failed by the prevailing context. Eventually, political constraints were eased, allowing NATO to pressure Serbian leadership with attacks on infrastructure and political targets, in effect bypassing the tactical difficulties experienced in Kosovo itself. But this option of switching focus to ‘regular’ warfare targets would not be available in later irregular conflicts where such targets simply did not exist. If the Gulf War had been a thematic successor to the Yom Kippur War, Kosovo was closer in many respects to Vietnam. The Air Force, however, was configured to win a war modeled on the conflicts in the Middle East, and had not processed the irregular aspects of its own experience in Southeast Asia.

A mismatch between regular warfare norms and irregular realities was even more apparent in Iraq and Afghanistan after 2003. Both theaters lacked regular military, government, and infrastructure targets after the fall of pre-occupation regimes. The insurgencies therefore echoed the irregular challenges of Vietnam and Kosovo but without viable options for transition to conventional modes of warfighting, and this created extreme difficulties for US and coalition forces. Frederick Kagan has criticized “transformed” American military power in Iraq for reducing war to a “targeting drill”, exhibiting a “technologically driven obsession with identifying and destroying enemy assets as the key problem of warfare” in a conflict that demanded restraint and a focus upon protecting the civilian population rather than attacking insurgent

¹⁸ Dag Henriksen, *NATO's Gamble: Combining Diplomacy and Airpower in the Kosovo Crisis, 1998-1999* (Annapolis, MD: Naval Institute Press, 2007), 191.

targets.¹⁹ Some within the Air Force recognized these limitations during the Iraq insurgency. A 2007 draft report argued the “US Air Force needs to reassess its capabilities across the spectrum of conflict and recognize the limitations resident within its current force construct toward irregular warfare... Air Force doctrine and theater command and control were designed to defeat conventional forces and field armies in major combat operations.”²⁰ Recent Air Force policy also admits that, in earlier years, a “high-end focus left a force structure that was less effective and efficient in conducting combat operations at the lower end of the spectrum of conflict.”²¹ Overall, however, the airpower community has been criticized for being “slow to understand conflicts in the lower band of the intensity spectrum.”²² Colin Gray argues that:

[To] an air person who naturally believes that his most favored military instrument inherently is an offensive and strategic tool of policy, the world of the enemy is akin to a bombing range or even a dartboard... the error [is] in confusing targeting with its effects and in conflating those effects with the whole narrative of warfare and of war itself.²³

The answer may be an increased emphasis on non-kinetic forms of airpower such as reconnaissance, and this is an observed trend; however, this remains in tension with the offensive traditions of a combat-focused Air Force, and must also be balanced against the

¹⁹ Kagan quoted in Keith L Shimko, *The Iraq Wars and America's Military Revolution* (New York, NY: Cambridge University Press, 2010), 162.

²⁰ Dag Henriksen, “Airpower: The Need for More Analytical Warriors,” in *Conceptualizing Modern War*, eds. Karl Erik Haug and Ole Jorgen Maao (London: Hurst, 2011), 221.

²¹ United States Air Force, *America's Air Force: A Call to the Future*, July 2014, 16.

²² Henriksen, “Analytical Warriors,” 228.

²³ Colin Gray, “Airpower Theory,” in *Airpower Reborn: The Strategic Concepts of John Warden and John Boyd*, ed. John Andreas Olsen (Annapolis, MD: Naval Institute Press, 2015), 172.

potential threat of near-peer competitors that have not necessarily disappeared.²⁴

It is important to balance this critique of Air Force capabilities in conflicts other than high-intensity 'war as battle.' The Air Force rebuilt itself during the later Cold War in response to a strongly perceived Soviet threat. Moreover, while the threat of interstate warfare on the NATO-Warsaw Pact model has abated since the end of the Cold War, it is not certain that a prudent nation might abandon regular warfare advantages such as those enjoyed by the US without consequence. In addition, American air power has not been *impotent* in irregular war situations. Hills admits that the "potential value of airpower's competencies" is "not at issue," and the Air Force has developed considerable tactical experience during more than a decade of irregular warfare.²⁵ Ultimately, however, American air power has not achieved the kind of decisive success observed during Desert Storm in subsequent conflicts. The mismatch between 'old war' means and 'new war' problems is a continuing challenge, and a repeating theme. Mark Clodfelter has argued that, in Vietnam, "doctrine deemed appropriate for a general war with the Soviet Union was ill suited for a limited conflict against an enemy waging guerrilla war."²⁶ This criticism remains as valid today as in its original context. Following Vietnam, the Yom Kippur War acted both as a lens that refocused existing organizational predispositions, and as a reflecting barrier that inhibited the assimilation of 'uncomfortable' - but potentially *useful* - lessons. This dual function enabled the creation of an unparalleled instrument of regular air warfare, but it also compromised an understanding of that instrument's limitations in conflicts at the messy, irregular edges of the intensity spectrum. Clodfelter's criticism can be inverted to reflect the fact that an updated

²⁴ Corum and Johnson, *Airpower in Small Wars*, 272.

²⁵ Hills, *Future War*, 75.

²⁶ Clodfelter, *Limits of Air Power*, 73.

doctrine “appropriate for general war with the Soviet Union” was extremely *well* suited to warfare against the Iraqi regime in 1991 and again in 2003. In the Balkans, however, and in later counterinsurgency campaigns in the Middle East and Afghanistan, Clodfelter’s unmodified critique stands. The enduring legacy of an American way of war - reinforced after Vietnam by the spectacle and timing of the Yom Kippur War - is a continuing tension between a regular military paradigm and frequently irregular contextual realities.

American-Israeli Parallelism

This tension has also been a feature of Israeli experience, and this leads to a final observation regarding the influence of the Yom Kippur War - its initiation of a long-term trend of American-Israeli military parallelism. The Yom Kippur War has been labeled “an almost unalloyed blessing because it marked the beginning of close ties between the USAF and the Israeli Air Force.”²⁷ This study has already identified the close relationships that were formed between American officers such as Robert Dixon and Don Starry and their Israeli counterparts after the 1973 war.²⁸ Equipment commonality was an additional element of US-Israeli interaction, and one that benefitted both Israel and the US Air Force. For example, the Israelis purchased the F-15 in the mid-1970s to contend with new Soviet aircraft in Arab service, but the sale also benefitted US leaders who sought to counter proposals that the F-15 program should be downscaled or abandoned in favor of simpler fighters.²⁹ The adoption of the F-15 by the “most combat-ready air force in the world” bolstered the platform’s credibility, and also offered “an excellent chance the F-15 would be tested in combat.”³⁰ Indeed, the first

²⁷ Marshall L. Michel, “The Revolt of the Majors: How the Air Force Changed After Vietnam,” PhD diss., Auburn University, 2006, 185.

²⁸ See Chapter 2, page 32, and Chapter 4, page 82.

²⁹ Michel, “Revolt of the Majors,” 249.

³⁰ Michel, “Revolt of the Majors,” 249.

recorded F-15 kill was achieved by the Israeli Air Force in 1979.³¹ The 1981 raid on the Iraqi nuclear reactor at Osirak achieved a similar combat ‘bleeding’ for the F-16.³² More significantly, the 1982 operation in the Bekaa Valley employed these aircraft and other American types such as the E-2C Hawkeye in combined operations that, as previously described, attracted follow-up American analysis.³³ The bilateral military relationship established after 1973 gave the Israelis continued access to advanced technologies as they conducted ongoing operations against their Arab neighbors. The US Air Force meanwhile benefitted from further vicarious combat experience as it reconfigured itself during the latter stages of the Cold War.

However, this military parallelism has extended beyond shared relationships, common equipment, and operational lessons. At a conceptual level, and in terms of strategic outlooks, the US and Israel have exhibited a similar view, or ‘way’, of war. Israeli strategic culture has been described as emphasizing “preemption, offensive operations, initiative and - increasingly - advanced technology.”³⁴ This clearly echoes American predispositions toward certain means and modes of warfare, and Israeli and American experiences have likewise been similar when applying an ‘old war’ paradigm to contextually difficult ‘new war’ problems. The high-intensity combat of October 1973 has not typified later Israeli experience. Israel has not fought a major conventional conflict against a neighboring Arab state since battling Syrian forces in Lebanon in 1982. In subsequent decades, Israeli security concerns have increasingly focused upon countering irregular forces in occupied

³¹ Brig Gen Moshe Marom-Melnik (Israeli Air Force), interview by Boeing, transcript at Boeing.com.

http://www.boeing.com/news/frontiers/archive/2003/december/i_ids5.html.

³² Ehud Yonay, *No Margin for Error: The Making of the Israeli Air Force* (New York: Pantheon Books, 1993), 361.

³³ Corum and Johnson, *Airpower in Small Wars*, 403. US post-conflict visit: see Chapter 3, page 65.

³⁴ Mahnken, *Technology and the American Way of War*, 3.

territories. Rather than armored Arab formations and Soviet-supplied combat aircraft, Israel has fought adversaries including the Palestinian Liberation Organization (PLO), Hamas, and Hezbollah. In a sense, Israel's 'Desert Storm moment' came early, in the Bekaa Valley in 1982. The later application of Israeli air power in irregular warfare has been no less ambiguous in its effects than parallel US experiences.

Israeli conflicts in Lebanon offer the clearest example of this, between 1982 and 2000 and again in 2006. The 1982 operation led to a prolonged ground occupation that deteriorated into "Israel's Vietnam" as attacks on occupying Israeli troops quickly diminished the afterglow of initial success in the Bekaa Valley.³⁵ Israel attempted to use air power to minimize risks to ground forces, first against the PLO in Beirut and then against Hezbollah throughout southern Lebanon. However, civilian casualties in Beirut invoked strategically damaging international criticism and, in the longer term, the "policy of air strikes on Hizbullah [sic] had no discernible effect."³⁶ The campaign was ultimately a "military victory and a political defeat for Israel" and Hezbollah remained a coherent organization when Israel pulled out of southern Lebanon in 2000.³⁷

The subsequent invasion of Lebanon in 2006 featured another extensive application of Israel airpower in response to Hezbollah border incursions, the kidnapping of Israeli soldiers, and the firing of rockets into Israeli towns and settlements. Israeli Air Force operational briefings focused on the number of targets engaged and the number of Hezbollah rockets destroyed, but this was a "classic and unsatisfying articulation of

³⁵ Anthony H. Cordesman and Abraham R. Wagner, *The Lessons of Modern War Volume 1: The Arab-Israeli Conflicts, 1973-1989* (Boulder, CO: Westview Press, 1990), 260-261.

³⁶ Corum and Johnson, *Airpower in Small Wars*, 413.

³⁷ Corum and Johnson, *Airpower in Small Wars*, 407.

warfare as physical destruction and ‘attrition.’ ”³⁸ In fact, rocket firings continued throughout the 34 day conflict, and a belated Israeli ground campaign suffered over 100 military fatalities against Hezbollah forces that employed an unexpected combination of irregular and conventional capabilities and tactics.³⁹ An official Israeli post-war commission found that the use of air power had been optimistic, and poorly matched the operational context: “...there were those in the [Israeli Defense Force] high command, joined by some in the political echelon, who entertained a baseless hope that the capabilities of the air force could prove decisive in the war.”⁴⁰ In fact, the Israeli Air Force “conducted two weeks of air strikes... in which it conspicuously failed to halt Hezbollah rocket attacks while it equally and conspicuously hit Lebanese civilian targets and caused extensive civilian casualties, serious collateral damage, and massive Lebanese evacuations.”⁴¹ Writing in 2007 on the problems experienced by Israeli air power against Hezbollah fighters in Lebanon, William Arkin summarized: “The primary task ahead then for military theorists and practitioners is to conceive of an integrated air-ground ‘effects based’ strategy that is suitable to the task of fighting terrorism and all of the inherent political realities associated with the modern use of force.”⁴² Further echoing Kaldor’s views on ‘old’ and ‘new’ war, Arkin asserted that the 2006 Lebanon conflict “demonstrates and justifies a clear transition needed from conventional to wholly new modes of warfare required for counterterrorism.”⁴³ Coincident with American

³⁸ William H Arkin, "Divining Victory: Airpower in the 2006 Israel-Hezbollah War," Air University Press (August 2007), 142.

³⁹ Anthony H. Cordesman, William D. Sullivan, and George Sullivan, *Lessons of the 2006 Israeli-Hezbollah War* (Washington, D.C.: CSIS Press, 2007), 5.

⁴⁰ “English Summary of the Winograd Commission Report.” *New York Times*, 30 Jan 2008.

http://www.nytimes.com/2008/01/30/world/middleeast/31winograd-web.html?_r=0.

⁴¹ Cordesman et al, *Lessons of the 2006 Israeli-Hezbollah War*, 120.

⁴² Arkin, “Divining Victory,” 143.

⁴³ Arkin, “Divining Victory,” 157.

struggles against insurgent forces in Iraq, the Israeli Air Force had struggled to defeat an unconventional enemy with conventional air power.

Finally, in these extra-paradigm and ‘uncomfortable’ conflicts, reciprocal learning seemed to be much reduced. The similarities between Israeli experiences in Lebanon between 1982 and 2000; initial American attempts to apply air power against insurgents in Iraq after 2003; and Israel’s second invasion of Lebanon in 2006, are striking. They suggest a repetition of mistakes or, at least, a shared inability to overcome the mismatch between ‘old war’ ways and ‘new war’ problems. Each nation could no doubt see *that* the other was failing to translate conventional superiority into strategic success, but it is not clear that either understood *why*. There was little evident mutual transfer of unambiguous ‘best practice’ because, it seems, no such best practice could be found.

In some areas, however, mutual learning or inspiration does appear to have continued, even if outcomes remain uncertain. The use of Israeli air power to target key individuals in occupied territories has been mimicked by the US and its allies in the ongoing struggle against Islamist extremists, especially in the Pakistan/Afghanistan border regions. Here, the US has combined a technology which the Israelis emphasized as ‘early adopters’ - unmanned air vehicles - with an operational concept also pioneered by Israel. This innovation has not been without controversy, however, and neither has it been unambiguously effective. Collateral damage remains an emotive issue; there are concerns that such strikes may increase popular resentment rather than degrade local support for opposition groups; the extent of CIA, vice Air Force, involvement has created some unease in the US; and such tactical actions appear symptomatic of managing, rather than

resolving, ongoing conflicts.⁴⁴ Nonetheless, this mutual innovation represents an attempt to broaden the air power paradigm and apply technological advantages against ‘new war’ foes. In conducting unmanned air strikes against individual extremists, and attempting to reconcile the tension between a still-dominant regular warfare paradigm and irregular threats, the US has once more followed an Israeli lead.

Overall, then, the Yom Kippur War reinforced and initiated significant trends at an overarching conceptual level, and these established still-relevant developmental vectors. The dominant influence of an American way of war can again be traced back *through* the intense regular combat of October 1973, while a military parallelism between the US and Israel can be traced back *to* the conflict. Both of these trends gave the developmental processes that have been outlined in the body of this study - in equipment, training, tactics, and doctrine - their direction, and their shape. The shaping of the modern US Air Force cannot be explained by considering direct American experience in isolation. The post-Vietnam generation was predisposed to rebuild an air force focused upon regular warfare, and the Yom Kippur War ensured this is exactly what it did. Moreover, significant mutual influence between the Israeli and US Air Forces may have begun in October 1973, but it has not been limited to that conflict - even if neither Israel nor the US has yet managed to translate ‘old war’ modes of air warfare into effective solutions to ‘new war’ problems.

The Vietnam-focused view of the US Air Force’s development after 1973 is not, therefore, wrong; but it is incomplete. The Yom Kippur War encouraged trends and themes that continue to influence the Air Force today. From discrete capabilities to an overall organizational mindset, the modern Air Force is a product of blended experiences - direct, and

⁴⁴ Mark Mazzetti, *The Way of the Knife: The CIA, a Secret Army, and a War at the Ends of the Earth* (New York: Penguin, 2013), 14, 228, 254.

vicarious. Interacting personal and organizational learning processes have created an unparalleled air instrument, although both the US and Israel continue to strive to understand the application of air power outside of conventional war. The key insight, however, lies in recognizing the importance of mutual, vice autonomous, development. The US Air Force may rightly understand the F-4 Phantom as an icon of its Vietnam experience and the subsequent reshaping of American air power; that reshaping, however, also owes a great deal to the experiences of Israeli Phantoms, dueling Arab SAMs, over the Sinai Desert and Golan Heights in October 1973.

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